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# USSR Report

SCIENCE AND TECHNOLOGY POLICY

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25 April 1984

## USSR REPORT

### SCIENCE AND TECHNOLOGY POLICY

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## ECONOMIC EXPERIMENT BEGUN AT USSR MINISTRY OF ELECTRICAL EQUIPMENT INDUSTRY

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 1, Jan 84 pp 41-44

[Article by G. Tovmasyan, director, Podol'sk Cable Plant imeni K. Gottwald, and A. Kuchushev: "The Experiment Has Begun" under the rubric "Improvements in the Economic Mechanism"]

[Text] Pursuant to the decisions of the 26th CPSU Congress and the November (1982) and June (1983) CPSU Central Committee plenums on improving the economic mechanism, a number of ministries, including the Minelektrotekhprom [USSR Ministry of the Electrical Equipment Industry] with its enterprises, made plans to conduct an economic experiment intended to broaden the rights of production associations (enterprises) in the planning and economic activities relating to strengthening the responsibility of work collectives for the on-schedule provision of the national economy (on the basis of contractual obligations) with the needed output, as well as for fulfilling output targets at a minimum cost of raw and other materials.

During the related preparatory period all the methodological materials and instructions were studied at the Podol'sk Cable Plant imeni K. Gottwald and tasks were elucidated to the broad aktiv--foremen and experts at shops, sections and services as well as every individual member of the collective. Much work in this direction was accomplished by the economic services, which drafted and analyzed several variants of labor, wage, production cost and income plans and calculated the volume indicators of output. The planned incentive funds, production development funds, and socio-cultural and housing funds were determined in accordance with new norms for 1984.

The success of this experiment hinges on many factors. First, it depends on the refinement of intra-plant cost accounting. In this connection, the following were adopted as the basic indicators of the cost-accounting performance of all subdivisions: completeness of the variety of their output, growth rate of work productivity and cost reduction per ruble of marketable output. Secondly, it depends on the acceleration of the work to mechanize labor-intensive processes. To this end, a priority list of the types of operations that need to be mechanized has been drawn up. Thirdly, it depends on further improvements in the brigade form of the organization and remuneration of labor which by the end of 1983 will have been extended to 60 percent of the workforce.

Special attention was paid to the problem of incentives. All the related regulations were revised to correspond with the new recommendations based on the "Law of Work Collectives" and the Decree "On Intensifying the Work to Strengthen the Socialist Discipline of Labor" of the CPSU Central Committee,

the USSR Council of Ministers, the All-Union Central Council of Trade Unions and the Komsomol Central Committee. These new provisions promote the active work participation of every employee, from the worker to the manager.

Much work was done to introduce the norms and determine the optimal schedules for the reception of customer orders and the minimum output and shipping quotas. Of course the experiment would not have been feasible without proper prior preparations such as the increased discipline of execution, increased responsibility of participants for the implementation of plan targets, the provision of proper working conditions for highly productive labor, etc.

It is still too early to assess the proposed system of economic instruments and incentives, but even now it can be stated that it affords to work collectives relative autonomy in streamlining and operating the economic machinery. Value of output and other plan indicators are determined on the basis of the state plan targets for the output of principal products in kind as well as the agreements concluded for their delivery. The exclusion of value indicators from the category of [centrally] approved indicators will make it possible to focus attention on increasing labor productivity and manufacturing products in the needed variety and volume according to the plan for contractual deliveries, which will become the principal indicators of the economic performance of enterprises. As part of the experiment, the enterprise was granted the right to dispose of its production development fund as it sees fit, in order to: streamline production, apply new equipment and technologies, or mechanize manual operations. Henceforth any balance remaining in that fund remains at the disposal of the enterprise instead of being transferred [to the state budget]. Thus, the enterprise's own capital has become the principal source for developing its production.

Under the new regulations, by April 1 every enterprise should mesh its output plan for the next year with its expanded variety of products manufactured. This enables enterprise directors to plan production in advance so as to fulfill the plan. Another requirement is that, once the plan as to the products list is approved, no one may have the right to revise it without consulting the work collective. One other factor should be emphasized: when approving a plan the director should be certain that the plant would receive funds for the materials needed to fulfill it. If not, he is obligated to send back output orders to the USSR Gosplan. It appears that more detailed instructions on this matter should be issued.

The question of how the socio-cultural and housing fund is to be utilized also should be considered. This fund is primarily used to finance housing construction. Unfortunately, it is inadequate for solving the enterprise's social-service problems. For example, at the Podol'sk Cable Plant, where the growth rate of work productivity in 1984 is expected to exceed 5 percent, the socio-cultural and housing fund in that year will amount to only 160,000 rubles. That is, the collective would need at least 10 years to accumulate sufficient funds for building just one apartment building. In our opinion, the current norm of 2-percent increment in that fund for every additional percent of increment in labor productivity, as calculated relative to a base year, is too low. The norm for that fund should be set at the level of 50 percent of the fund for material incentives.

In addition, enterprise collectives are not equally positioned as regards crediting the fund for material incentives. A 15-percent increase in that fund is awarded to any enterprise which exceeds its delivery plan by 100 percent. It would make sense to differentiate the percentage of that increase in view of the fact that some plants specialize in a few types of production, e.g. the Kamenets-Podol'skiy Cable Plant which manufactures three groups of products, while others, such as the Podol'sk Cable Plant with its 17 product groups, are more diversified.

Another problem that has to be considered is that of establishing higher extra-pay rates and allowances in addition to base pay in all wage categories for engineers, technicians and white- and blue-collar workers as an incentive for cross-training in skills and professions. Upon consultation with the trade-union committees at the associations (enterprises), such higher allowances may be introduced as a result of wage-fund economies. At the same time, a ceiling has been set on expenditures on administrative personnel, thus limiting the ability of the managers to grant extra pay allowances for this category of employees. Would not it be better to exclude the extra pay allowances for administrative personnel from the allocation ceilings? It appears that this question has to be further considered.

As part of the experiment, 40 percent of sinking-fund deductions and 8 percent of income are credited to the production development fund. As a result, substantial funds accrue to many enterprises. However, for such enterprises as the Podol'sk Cable Plant, where 63 percent of the equipment is obsolete, such proportions are insufficient for renovating equipment. Hence, the ministries should re-examine the norms for sinking-fund deductions so as to adapt them to the age and changing prices of equipment and differentiate them for different enterprises. Otherwise it would be difficult to attain an increase in labor productivity. At the Podol'sk Cable Plant the mean annual growth rate of labor productivity has been 3.6 percent, but the Soyuzelektrokabel' All-Union Electrical Cable Production Association has set it at 5.3 percent in the 1984 plan for this plant. If this new level is to be attained, the economic effect of the ratio of the growth rate of that indicator to normative net output should be 300,000 rubles. This can be accomplished by the plan if in 1984 it manufactures 2,000 km of new high-capacity conductors whose use would save the national economy about 1.5 million rubles. The manufacture of new and better products would serve to increase the wage fund by 50,000 rubles. Naturally, this would interest the collective in making these products.

An important role in fulfilling completely the plan of output by volume and variety and enhancing the effectiveness of production is played by specialization. In recent years, steps to promote specialization at this plant, taken with the aid of the Soyuzelektrokabel', resulted in nearly doubling in 1983 the output of particularly scarce cable products compared with the preceding year. At the same time, much has yet to be done as regards modernizing production. At present the plant manufactures both old-style conductors developed as far back as in 1946 and new more modern conductors of the same kinds but with improved electroconductivity and heat resistance and of lower weight. The plant's management has long been voicing its wish to completely discontinue the manufacture of the obsolete products and supplant them with their more modern counterparts. This would benefit both the plant, which would produce several million rubles more of marketable output, and the national economy as a whole, since it would conserve costly raw materials and

yield savings on the scale of 60 million rubles annually. However, it was not feasible to modernize the sector for machining installation wiring prior to the beginning of the experiment. Now that the experiment is on, the plan can implement this modernization, which will cost 450,000 rubles. But the solution of this highly urgent problem at the enterprise requires assistance from the USSR Minelektrotekhprom and the USSR Gosplan.

An important prerequisite to a successful conduct of this experiment is balancing the plan with the production capacities and funding. The USSR Gossnab, the USSR Ministry of the Chemical Industry and the supplier enterprises have been repeatedly notified that the plant is receiving plasticizer supplies incompletely and behind schedule. But so far no major changes to the better have occurred.

In the course of the experiment, the economic performance of enterprises will be evaluated primarily according to the fulfillment of their sales plans with allowance for their contractual delivery obligations. Orders placed for deliveries of end-products are becoming the basis for all contractual relations. Certain planners and administrators believe that the shortcomings in planning will disappear once contractual relations are introduced. But an examination of any of the orders received by the enterprise's marketing department will reveal that the plant is supposed to ship its output to approximately 150 consignees. For example, the Podol'sk Cable Plant has about 6,000 customers who need 11,500 different cable items. Gearing the plan of variety of output to such a quantity of orders is extremely complicated. Even if that plan is adopted, it soon becomes clear that it is of little use because it is often revised in the course of the year. Some customers ask that cable products be dispatched to a particularly important facility while others ask that the grade of cable be changed and others still want changes in the volume and schedule of deliveries. Some orders simply cannot be met on schedule. Thus, a customer orders 1 km of cable which requires retooling the production equipment, etc. In our opinion, orders and deliveries should be enlarged quantitatively. Enterprises should ship larger lots of their products to the territorial supply-and-marketing administrations existing in every region of the country. These administrations, in their turn, are obligated to smooth out relations with customers and develop an efficient system for picking up and delivering freight on circular and segmented routes from railheads. It is precisely to perform such mediating activities that the Gossnab's organizations have been established. An efficient performance by the railroads is an important factor in the on-schedule conveyance and deliveries of freight, but as yet it is the subject of many complaints.

As the economic experiment is being applied, enterprises are converting to the normative method of income distribution. This enables them to draft their own financial plans and bear greater responsibility for their fulfillment. Their incentive funds will hinge on the fulfillment of their income plans. Beginning in 1984 the enterprises have been granted for the first time the right to establish a reserve fund amounting to 5 percent of the norm for their liquid capital and deriving chiefly from plan-exceeding income. At the Podol'sk Cable Plant that fund would reach an impressive amount. For example, had the this right been granted in 1983 to our collective, we could have accumulated a reserve fund of 470,000 rubles which would have served to offset the extra expenditures on capital repair as well as on housing construction and other social needs. Another important factor is that any unutilized balance



of the reserve fund also remains at the disposal of the enterprise. From the outset of the experiment, it is necessary to intensify the monitoring of both the fulfillment of the income plan and the calculations of production cost as well as adherence to the norm for reducing expenditures by all subdivisions of the plant.

In the next few years the Podol'sk Cable Plant will still have to accomplish a great deal, primarily as regards increasing the responsibility of every member of its workforce for the job entrusted to him. The experiment can be conducted successfully only if tight discipline is observed at every production sector.

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## SCIENTIFIC-TECHNICAL COOPERATION AMONG CEMA ACADEMIES OF SCIENCES DISCUSSED

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 9, Sep 83 pp 76-81

[Article by V. Primachenko under rubric "Economy of the Countries in the Socialist Community": "Interacademy Cooperation Among the CEMA Member Countries Under Conditions of Scientific-Technical Integration"]

[Text] The objective basis of the integrational processes that are developing at the present time is the internationalization of production. As V. I. Lenin pointed out, ". . . the entire economic, political, and spiritual life of man becomes increasingly internationalized under capitalism. Socialism entirely internationalizes it"<sup>1</sup>.

The process of the internationalization of economic activity was promoted by the progress of science and technology in the nineteenth century. Machine production became the starting point and the chief arena of the internationalization of the productive forces and served as the impetus for the development of the international division of labor. K. Marx wrote that ". . . Thanks to the application of machinery and steam, the division of labor took on such dimensions that large-scale industry, divorced from the national soil, depends exclusively on the world market, on international exchange, and the international division of labor"<sup>2</sup>.

Whereas the division of labor is a very important indicator of the social nature of production within the confines of an individual state, international division of labor is the chief indicator of the internationalization of the productive forces. It is precisely the international division of labor that gives production its international nature, that promotes the development of the integrational processes. Integration, as a stage in the internationalization of economic activity, arises on the base of the intensive development of economic interrelationships, the intertwining of the national reproduction processes, and the reorganization of the economic structures in the countries that are participating in the integration.

The basic tasks and goals of socialist economic integration have been defined in the Comprehensive Program for the Further Deepening and Improvement of Cooperation and the Development of Socialist Integration, which was adopted in June 1971 at the 25th meeting of the CEMA Session. The significance of that document lies in the fact that it sets down for a prolonged period of time and in a comprehensive manner the tasks of cooperation, including those in the field of science and technology.

One of the most important natural laws underlying the internationalization of production is its dialectical interrelationship with the similar process in the sphere of science. The structural changes occurring in it, and the specialization and cooperative nature of scientific research are accompanied by a process of their concentration. This is caused by the large scope of production, and by the need to unite the efforts of large collectives of scientists. Science, like production, has gone beyond the confines of individual states. The objective need for the most effective use of the results of the scientific-technical revolution has led to the deepening of the interrelationship between the productive and material resources of the individual countries. Just as the international division of labor has given production international features, the international division of the labor performed by scientists has marked a process of the internationalization of science, a process that is characterized by the rapid increase in scientific knowledge, by the expansion of the spheres of the fundamental and applied research, and by an overall tendency toward the increase in the cost of conducting scientific-research projects with the efforts of each of the CEMA member countries. The problems that arise in this regard are resolved by means of the deepening of the international socialist division of labor in the area of science and technology, as well as the expansion of the sphere and the improvement of the organizational forms and methods of carrying out the scientific-technical integration. "Scientific-technical integration is a very important element in international socialist integration and presupposes the coordination of the scientific-technical policy of the CEMA countries, the coordination of scientific research on the basis of the international division of labor, the joint conducting of important research, the exchange of experience, and cooperation in the field of inventiveness and patent affairs"<sup>3</sup>.

The participants in the fulfillment of the tasks that have been posed by scientific-technical integration are the international organizations of the CEMA countries, the national ministries and departments, and the scientific-research and planning-and-designing institutions. An important place in this process is given to the cooperation among the academies of sciences of the socialist countries. "This cooperation," states the Communique on the Conference of Presidents of the Academies of Sciences of the Socialist Countries, "increases by many times the scientific capabilities of the socialist countries and serves as the basis for the coordination of the efforts in the resolution of the most complicated and most vitally important problems"<sup>4</sup>. The effectiveness of this cooperation is determined by the advantages that are typical of the international division of labor in the area of science, by the elimination of parallelism and duplication in the conducting of expensive research projects, primarily in the field of exploratory fundamental research. The requirement for the outstripping development of fundamental projects with respect to applied research and developments is common for any industrially developed country whose goal is the acceleration of the rates of scientific-technical progress. The Communist and workers parties of the fraternal socialist countries poses as their task the organic unification of their achievements, in order to reduce the "science to technology to production" cycle. The 25th and 26th CPSU Congresses set down the basic trends for the acceleration of the rates of

scientific-technical progress in our country and defined the place and importance of fundamental research. The materials pertaining to the congress state that ". . . the powerful stream of scientific-technical progress dries up if it is not constantly fed by fundamental research"<sup>5</sup>, which, to a greater degree, must be concentrated "on the resolution of the key questions in the national economy, on the discoveries that are capable of making genuinely revolutionary changes in production"<sup>6</sup>.

In the development of fundamental research, as President of the USSR Academy of Sciences, Academician A. P. Aleksandrov, pointed out, ". . . an increasingly large and mutually enriching role is played by cooperation with the scientific organizations of the socialist countries. This will unconditionally lead to a substantial increase in the productivity of scientific labor, and to the acceleration of scientific-technical progress"<sup>7</sup>.

During the period of more than 35 years of cooperation among the academies of sciences of the socialist countries, considerable successes have been achieved: important results that have enriched domestic science have been obtained; qualitative changes have occurred in the organizational structure of cooperation; and the forms of joint activity have been improved. At first these were friendly contacts with individual academies of sciences and institutes. Reciprocal detached-duty assignments were carried out, as a rule, with the purpose of exchanging experience. Then the cooperation plans began to be coordinated. By the mid-1950's the scientific contacts among the academies of sciences of the socialist countries had become considerably developed and the relations among them had been legally established. In the late 1950's and early 1960's the first bilateral agreements governing scientific cooperation were signed. Joint projects to which financial means were allocated began to be conducted. Without the confines of the agreements that had been concluded, first annual work plans, and then work plans for longer periods of time, were signed, to coordinate the cooperation.

The comprehensive program for the socialist economic integration oriented the CEMA member countries toward the further deepening of the multilateral scientific ties, including those in the joint resolution of important fundamental problems having long-range importance for the development of the national economy.

In December 1971 the Agreement Governing Multilateral Scientific Cooperation Among the Academies of Sciences of the Socialist Countries was signed in Moscow. It was signed by representatives of the academies of sciences of Bulgaria, Hungary, East Germany, Cuba, Mongolia, Poland, Romania, the USSR, and Czechoslovakia. In 1971 the National Center of Scientific Research and the Committee of Social Sciences of Vietnam joined the agreement, and in 1981, the North Korean Academy of Sciences. The agreement is an important document that defined the goals and forms of the joint activity. It indicated that the cooperation among the academies would promote ". . . the more effective use of the scientific capabilities of all the socialist countries and the development of socialist integration in the area of science"<sup>8</sup>. Thus, the signing of the agreement marked the beginning of a qualitatively new phase in international cooperation and the integration of science. We have also seen a development of such forms of it as coordination and cooperative action during

the conducting of scientific research; the publication of joint works; the establishment by the interested sides of journals with international editorial boards; the organizing of scientific conferences, seminars, etc.; the exchange of scientific associates, lecturers, and consultants; the conducting of experimental projects in accordance with coordinated plans; the joint use of laboratories, one-of-a-kind instruments, units, etc. The agreement was of great importance for the further development of bilateral ties. In 1975 an understanding was reached concerning the changeover to a five-year period for the planning of bilateral cooperation between the USSR Academy of Sciences and the academies of sciences of the socialist countries.

The experience of the joint work has indicated that a further increase in the effectiveness of scientific cooperation requires the concentration of efforts on a comparatively small number of topics that are of great importance for the national economy. In 1981 a classification of the subject matter for scientific cooperation was introduced. The basis of that classification is the system that has been accepted at agencies of CEMA. The most important and longest-term projects are realized in the form of cooperative action with joint efforts. The conducting of operations for most of the topics, as used to be the case, is done in the form of coordination, and, for individual topics, in the form of consultative sessions<sup>9</sup>.

The UkSSR Academy of Sciences carries out the basic work in the field of international scientific ties within the framework of agreements governing scientific cooperation that were signed between the USSR Academy of Sciences and the academies of sciences of the socialist countries. Bilateral and multilateral cooperation among the academies of sciences is fruitfully supplemented by the direct ties with non-academy scientific-research institutions and industrial enterprises in those countries. They are carried out on the basis of the decisions made by bilateral intergovernmental subcommissions for scientific-technical cooperation.

From year to year there has been an increase in the number of jointly developed topics for cooperation: in 1975, research was carried out on 98 topics; in 1980, 180; and in 1981, on 240 topics. During the years of the 10th Five-Year Plan more than 4000 scientists from UkSSR Academy of Sciences were sent on detached-duty assignments to the socialist countries. During that same period of time the institutions of the Academy of Sciences were visited by more than 7000 scientists and specialists from the socialist countries. More than one-third of the reciprocal detached-duty assignments were carried out in accordance with plans for bilateral and multilateral scientific-technical cooperation. During the years 1971-1982 approximately 150 conferences, symposiums, seminars, and meetings were held in the Ukraine. More than 2500 scientists and specialists from the socialist countries took part in their work. The Central Scientific Library of the UkSSR Academy of Sciences carries out active book exchange with the libraries of the socialist countries. During the 10th Five-Year Plan its volume exceeded 240,000 items of printed output.

The progress in cooperation has been promoted by the establishment of coordination centers in the CEMA member countries. At the UkSSR Academy of Sciences such centers were established on the basis of the Institute of

Electric Welding imeni Ye. O. Paton (the Svarka KOTs [coordination center]) and the Institute of the Problems of Material Studies (the Poroshkovaya Metallurgiya KOTs). The participants in the implementation of the program connected with the Svarka [welding] problem include more than 100 scientific-research, planning-and-designing organizations, and industrial enterprises in Bulgaria, Hungary, East Germany, Poland, Romania, the USSR, and Yugoslavia. As a whole within its confines, on the basis of the coordination, approximately 200 projects have been completed; their results have been introduced into the production of the cooperating countries. During the implementation of the program, experience was accumulated in the use of such a form of cooperation as the establishment of cooperatives, when, by the joint efforts of the partners, a single model of a particular type of equipment is developed that conforms to the needs of the cooperating sides. For example, joint efforts of East German and Soviet specialists went into the designing and manufacture of the IES-TsIS/700 electronic-ray unit, which is intended for welding articles in the automobile industry. The introduction of the unit at enterprises of East Germany and the USSR made it possible to increase the labor productivity and to reduce the production costs. The economic benefit from its application at only one of the plants in the USSR comes to more than 70,000 rubles<sup>10</sup>.

The efforts of scientists engaged in material studies have been directed at the development of high-strength materials. Powder metallurgy is a classic example of the most promising technological processes. Its methods exclude such traditional processes as smelting and casting and make it possible to do without mechanical processing. Every thousand tons of articles produced by powder metallurgy yields a saving of more than 165 million rubles, and saves 2,500 tons of rolled metal. The parts are given the properties that are impossible to obtain by any other method. For example, the durability of a cutting tool manufactured from quick-cutting metallurgy steel increases by a factor of 5-6<sup>11</sup>.

As a whole within the confines of the programs for multilateral scientific-technical cooperation, the institutions of the UkSSR Academy of Sciences participate in the implementation of more than 100 topics. The Institute of Cybernetics imeni V. M. Glushkov and the Institute of the Economics of Industry, of UkSSR Academy of Sciences, take part in projects that are coordinated by the Intergovernmental Commission of the CEMA Member Countries for Computer Technology. The scientists at the Institute of the Problems of Oncology imeni R. Ye. Kavetskiy, of the UkSSR Academy of Sciences, are carrying out research on the combined problem "Malignant Neoplasms." A number of institutes are participating as co-executants in the development of such topics as "The World Ocean," "The Protection of Ecosystems and Landscapes," "The Global System of Monitoring of the Environment," etc. In conformity with the Program for Multilateral Scientific Cooperation by the Academies of Sciences of the Socialist Countries for 1981-1985, the institutes of the UkSSR Academy of Sciences are conducting research on 15 problems in the area of the natural and social sciences.

There has been an expansion of the subject matter and an improvement in the forms of the interrelationships among the academy institutions of the UkSSR

Academy of Sciences and the socialist countries on a bilateral basis. Cooperation in the field of the development of fundamental research has been called upon to serve the creation of the necessary backlog in the leading areas of science and the development of applied research. As was already pointed out, it is carried out on the basis of agreements governing scientific cooperation between the USSR Academy of Sciences and the academies of sciences of the socialist countries. The approved problem and topic plans for 1976-1980 and the first two years of the current five-year plan have been successfully fulfilled. For example, within the confines of those plans, scientists at the Institute of Cybernetics imeni V. M. Glushkov, UkSSR Academy of Sciences, and the F. Schiller University (East Germany) have developed theoretical evaluations of the working capability of various types of logical and memory elements.

In conformity with the cooperation working plan, the Institute of Physical Metallurgy, Czechoslovak Academy of Sciences; the Institute of Machine Mechanics, Slovak Academy of Sciences; and the Institute of Problems of Durability, UkSSR Academy of Sciences carried out projects to determine the criteria for the destruction of materials and structural elements with a consideration of the real operational conditions. The economic benefit from the introduction of the results of the theoretical research at a number of industrial enterprises in the USSR comes to more than one million rubles a year.

Scientists at the Institute of Theoretical Physics, UkSSR Academy of Sciences, and the Institute of Nuclear Physics, Romanian State Committee for Nuclear Energy, combined their efforts to study a number of fundamental scientific problems in the theory of magnetic and optical phenomena in magnetically ordered crystals. The Institute of the Geochemistry and Physics of Minerals, UkSSR Academy of Sciences, and the Institutes of Geology, Czechoslovak Academy of Sciences and Slovak Academy of Sciences, thanks to the work that was jointly done, obtained fundamentally new data concerning the age of Pre-Cambrian correlations. That made it possible to establish the Paleozoic age of crystalline rocks in the major structures situated on the territory of Czechoslovakia. The result of the cooperation between the scientists at the Institute of Problems of Material Studies, UkSSR Academy of Sciences, and the B. Kidric Institute of Nuclear Sciences, Serbian Academy of Sciences and Arts (Yugoslavia) was the data that largely explains the mechanism of sintering. A joint group of authors prepared and published in Yugoslavia two monographs dealing with problems of sintering. A specific result of the cooperation between the chemists of the UkSSR Academy of Sciences and the Czechoslovak Academy of Sciences was the creation of KL-3 medical glue, which is intended for application in various areas of surgery. In recognition of this work they were awarded a joint prize of the Presidium of the USSR and Czechoslovak Academies of Sciences.

One of the forms of the fruitful scientific cooperation among the scientists of the academies of sciences of the socialist countries in the area of the social sciences is the holding of regular meetings within the confines of bilateral commissions. These meetings are frequently conducted on the base of the Institute of History, UkSSR Academy of Science, where the mixed commissions of historians have had sessions. For example, at the 5th Plenary Session of the Commission of Historians of the USSR and Czechoslovakia (1974)

the participants discussed the theoretical problems of the building of socialism in the two countries, the overall and specific features in their development, the resolution of national problems, etc. The session of the Commission of the Historians of the USSR and Bulgaria that was held in 1978 was devoted to the thirtieth anniversary of the Treaty of Friendship, Cooperation, and Reciprocal Aid between the USSR and Bulgaria. At the 27th Scientific Conference that was held this year (within the framework of the Commission of Historians of the USSR and East Germany), the participants considered the vitally important processes of world development and the works dealing with the criticism of the fascist and neofascist concepts.

In May 1977, on the base of the Institute of Philosophy, UkSSR Academy of Sciences, the 7th Session of the bilateral Commission of Philosophers of the USSR and East Germany was held. That session was devoted to the sixtieth anniversary of the Great October Socialist Revolution and to the development of the Marxist-Leninist philosophy during the post-October period. The materials of the session were used to publish the collection "Velikiy Oktyabr', dialektika razvitiya sotsializma i nauchnogo materialisticheskogo mirovozzreniya" [The Great October and the Dialectics of the Development of Socialism and the Scientific Materialistic Political Philosophy].

In 1976 the Problem Commission of the multilateral scientific cooperation among the socialist countries, dealing with the problem "The Economics and Politics of the Developing Countries," jointly with the Social Sciences Section of UkSSR Academy of Sciences, conducted in Kiev an international conference that was devoted to an analysis of the concepts of the socioeconomic development of the "third-world" countries. More than 200 scientists took part in its work. The conference confirmed the necessity of coordinating the actions of the social scientists in the socialist countries in the area of the criticism of the anti-Marxist concept in the development of the "third-world" countries.

The work on the publication of the "Cheshsko-ukrainskiy slovar'" [Czech-Ukrainian Dictionary] is coming to an end. This is a reference-type publication that is of an applied scientific nature.

The problem and topic plans for scientific cooperation between the USSR Academy of Sciences and the academies of sciences of the socialist countries in 1981-1985 provide for the participation of a number of institutes of UkSSR Academy of Sciences. Together with their colleagues from the fraternal countries of socialism, the Ukrainian scientists participate in projects in such topics as "Methods and means of designing electronic computers," "The mechanics of continua," "Solid-body physics and material studies," "Comparative isotopic geochronological research of the Rhodope Massif and the Ukrainian Shield," "The physiology of growth and the development of plants and animals," "States of the building of socialism in Hungary and the USSR," etc.

A considerable amount of attention is being devoted to the development of direct bilateral relations and the development of important applied scientific-technical problems. The carrying out of this research makes it possible for the collectives that are participating in the cooperation to



become acquainted with the highly effective technological equipment, the organizational methods, and the results of the work that has been done, and this, in the final analysis, gives them the opportunity to select the optimal ways to conduct their scientific search with the minimal expenditures and the greatest return on their efforts, for purposes of the further development of the national economy and the acceleration of the rates of scientific-technical progress.

There have been a sufficiently large number of examples of mutually advantageous cooperation. We would like to cite several of them, which characterize the results of the joint activity in various branches of science. During the years of the 10th Five-Year Plan, a number of enterprises in the USSR introduced a specialized time-shared system (SPOK-Yes) that had been developed as a result of the cooperation among the scientists at the Institute of Cybernetics imeni V. M. Glushkov, UkSSR Academy of Sciences, the Central Scientific-Research Institute of Complete Automation, and the Institute of Computer Technology, People's Republic of Bulgaria. The system is intended for the automated instruction and service for the users of electronic computers. The economic benefit from its application came to more than 500,000 rubles a year.

Since 1972 there has been cooperation between the Institute of Electrical Welding imeni Ye. O. Paton, UkSSR Academy of Sciences, and Energoinvest (Yugoslavia) in vitally important areas of welding science and technology. On work orders issued by the Yugoslav side, scientific-research projects have been carried out frequently on a contract basis. For example, participants in the projects have designed structural elements for welded supports made of aluminum alloys for electrical transmission lines, the weight of which structurals, as compared with the existing ones, has been reduced to almost one-eighth; they have prepared recommendations for the relieving of residual stresses by the explosion method in designs of decomposers of the Birac alumina plant; and have manufactured a device for the measurement of residual stresses.

Scientists at the Institute of Problems of Material Studies, UkSSR Academy of Sciences, jointly with specialists at a number of scientific institutions and industrial enterprises of the East German Ministry of Metallurgical, Mining, and Potassium Industry, developed the technological processes for the production of electrode tape. The economic benefit from its introduction at the Brovary Powder Metallurgy Plant, USSR Minchermet, came to more than 1000 rubles per ton of steel being built up.

Hungary, Czechoslovakia, and the other socialist countries are making wide use of diamond cutting tools developed by specialists of the Institute of Super-Hard Materials, UkSSR Academy of Sciences. Mobile exhibitions of diamond cutting tools that have been frequently conducted by the institute jointly with the Stankoimport V/O [All-Union Association] have been very successful in Yugoslavia. Measures such as this contribute to the propagandizing of the achievements of Soviet science and to increasing the export of cutting tools made of super-hard materials. Shipments of those tools in 1980, as compared with 1966, increased by a factor of more than 20.

The Institute of Problems of Casting, UkSSR Academy of Sciences, jointly with the scientific institutions and industrial enterprises of Bulgaria, is carrying out research on the topic "Development of the theoretical and technological principles of the method of casting with gas counterpressure," and is cooperating with the GISAG Combine (East Germany) on the topic "Automation and mechanization of processes of casting production." The MDN-6 magnetodynamic units which were developed at IPL [Institute of Problems of Casting], UkSSR Academy of Sciences, and which are intended for the electromagnetic teeming of zinc alloys, are being delivered abroad.

The Institute of Problems of Machine-Building, UkSSR Academy of Sciences, jointly with the NII [Scientific-Research Institute] of the Skoda People's Enterprise (Czechoslovakia), has been conducting research since 1976 on the topic "Increasing the reliability of machine-building articles." The scientists and specialists were given the task of developing effective methods for computing the elements of powerful turbomachines for static and dynamic strength. The economic benefit from the application of the methodologies for computing the strength and for optimizing the responsible assemblies at enterprises in Kharkov has come to more than a million rubles a year.

In 1980, with the participation of Ukrainian chemical scientists, a number of enterprises in Bulgaria carried out the semi-industrial production of compositional materials on the basis of modified fillers obtained by a technological process that had been developed at the Institute of Colloid Chemistry and the Chemistry of Water imeni A. V. Dumanskiy, AkSSR Academy of Sciences.

Thus, the joint efforts of the cooperating countries have been leading to specific results, the introduction of which has been called upon to assure the further acceleration of scientific-technical progress.

At the present time new and improved methods and forms of international interaction are still in the embryonic stage and are being constantly established.

In recent years one of the new forms of the bilateral ties in cooperation among the academies of sciences has been the conducting of joint scientific and scientific-organizational measures by the departments of sciences that share the same area of specialization. For example, in May 1979, in Berlin, there was a joint session of the Bureau of the Department of Chemistry, East German Academy of Sciences, and the Bureau of the Department of General and Technical Chemistry, USSR Academy of Sciences. In October of the same year, in Moscow, there was a joint scientific session of the Department of Chemistry, East German Academy of Sciences, and the Department of General and Technical Chemistry, USSR Academy of Sciences, which was devoted to the thirtieth anniversary of the formation of the German Democratic Republic [East Germany]<sup>12</sup>.

In the late 1970's and early 1980's a new situation prevailed in the development of the economic and scientific-technical cooperation among the CEMA member countries, which situation was influenced by the need to make

the transition from the extensive management of the economy to the modern, intensive-type economy. The deepening of socialist economic integration is linked with the resolution of a number of important problems. For example, the organizational questions in the cooperation of the CEMA member countries have not been completely resolved, by virtue of which, in the area of science and technology, that cooperation still corresponds insufficiently to the objective requirements of the modern stage of the scientific-technical revolution or the existing opportunities. As a whole the mechanism of the scientific-technical cooperation continues to be a multistage one, and there has been little development of the direct ties between the organizations that are the cooperating executants, including the ties on a contract basis. Within the confines of the concluded agreements, there is a predominance of the coordination of research and development, without any contractual formulation of the obligations of the cooperating sides<sup>13</sup>.

These and other causes of both an internal and an external nature led to a situation in which, in the present decade, the CEMA countries will have to carry out the adjustment of the methods of the economic policy and practice of planning. The improvement of planning and control of scientific-technical cooperation is one of the primary tasks in the further development and deepening of socialist economic integration. At the present time many CEMA countries have arrived at that stage when it is impossible effectively to develop reciprocal economic ties without the active inclusion of associations and enterprises into the integrational processes. Documents that are aimed at the buildup of the direct ties that are the fundamentally important area in the improvement of the mechanism of socialist integration are the decisions of the 26th CPSU Congress and the congresses of the other fraternal parties<sup>14</sup>.

Taking that into consideration, at the 35th Meeting of the CEMA Session a decision was made to recommend to the countries that are members of the organization, for purposes of the further improvement and increase in the effectiveness of scientific-technical cooperation and the increase of its contribution to the economic development of the countries and their scientific-technical progress, that they undertake measures that are aimed at the preferential development of cooperative actions for the creation of advanced technological processes, technology, and new materials on the basis of contracts, with the precise regulation of the reciprocal pledges taken by the contracting sides for obtaining with the shortest period of time the scientific-technical results (creating the necessary conditions for the broad development of contractual cooperation and direct ties between the executant organizations), and also for the accelerated development and introduction of the results that were fulfilled in the course of the cooperation.

Soon after the completion of the work of the 35th Meeting of the CEMA Session a decision was made to change over to a contractual basis the scientific-technical cooperation among the ministries and departments of the USSR and the other CEMA member countries. This process is carried out in conformity with the existing normative documents and recommendations of the CEMA agencies. The first problems and topics that are being converted to a contractual basis are those for which their development must be completed in the current five-year plan by the development and organization of the production of new

machines, equipment, materials, and technological processes on the basis of specialization and the formation of cooperatives, as well as the problems and topics for which, in the current five-year plan, it is necessary to complete scientific-research, experimental-designing, and planning projects, as a result of which experimental models of output can be produced in the next five-year period.

For the scientific-technical problems which it is planned to change over to a contractual basis, it is necessary to conclude interdepartmental, and in individual instances intergovernmental, agreements. A mandatory component of them must be a program of scientific-technical cooperation with regard to the selected problem, which represents a planning document that provides for the reciprocal actions of the participating organizations in fulfilling the pledges that were taken. That program indicates: the types of projects, the deadlines for their fulfillment, with a clear-cut division of the labor among the partners, the estimated expenditures of the participating countries, if there exists a state of agreement concerning the shared financing of operations, etc. At the stage of the preparation of the program, one determines the preliminary needs of the participating countries for the output to be produced and the tentative data concerning the possible volumes of producing it. The developed programs are coordinated by the appropriate agencies of the CEMA: for interbranch problems, by committees; for branch problems, by the branch standing commissions and international organizations of the CEMA member countries.

In the methodological recommendations that regulate the transition of scientific-technical cooperation to a contractual basis, an important place is assigned to the questions of determining the effectiveness of the cooperation. Other than the results that can be determined in terms of cost, international scientific-technical cooperation guarantees the obtaining of scientific-theoretical, social, socioeconomic, and political results, which consist in the adjustment of the creative contacts among the scientists, the improvement of medical service and education, the improvement of the working conditions, the reinforcement of the positions of the USSR and the countries in the socialist community on the international scene, etc.

The UkSSR Academy of Sciences is carrying out work to establish direct ties and to change the cooperation to a contract basis, and also to ascertain the contractual subject matter. This pertains in full measure to the questions both of bilateral and multilateral cooperation. With the Kiev Branch of the Vneshtekhnika V/O acting as the intermediary, samples of various materials are being exported to the socialist countries -- diamond powders and pastes, welding apparatus, computer systems, etc., that have been developed and manufactured in institutes of UkSSR Academy of Sciences.

The positive changes that are occurring create the prerequisites for the successful resolution of the important scientific problems that have been defined by the Comprehensive Program for Socialist Economic Integration, and by the programs for multilateral and bilateral scientific cooperation among the academies of sciences of the socialist countries in 1981-1985.

#### FOOTNOTES

1. Lenin, V. I., "Poln. sobr. soch." [Complete Collected Works], Vol 23, p 318.
2. Marks [Marx], F., Engel's [Engels], F., "Soch." [Works], Vol 4, p 157.
3. "Problemy povysheniya ekonomicheskoy effektivnosti obshchestvennogo proizvodstva v sotsialisticheskikh stranakh" [Problems of Increasing the Economic Effectiveness of Social Production in the Socialist Countries], Moscow, "Ekonomika," 1973, p 221.
4. PRAVDA, 19 February 1977.
5. "Materialy XXV s"yezda KPSS" [Materials of the 25th CPSU Congress], Moscow, Politizdat, 1976, p 48.
6. "Materialy XXVI s"yezda KPSS" [Materials of the 26th CPSU Congress], Moscow, Politizdat, 1981, pp 42-43.
7. "XXV c"yezd KPSS. Stenograficheskiy otchet" [25th CPSU Congress: Stenographic Report], Moscow, Politizdat, 1976, Vol 1, p 217.
8. "Mnogostoronneye sotrudnichestvo akademiynauk sotsialisticheskikh stran" [Multilateral Cooperation Among the Academies of Sciences of the Socialist Countries], Moscow, "Nauka," 1981, p 283.
9. See: Ibid., pp 92-93.
10. See: Paton, B., "Problems of the Introduction of the Achievements of Scientific-Technical Progress into Production," EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV, No 3, 1981, pp 56-60.
11. See: Marchuk, G., "The Participation of the USSR in the Scientific-Technical Cooperation Among the CEMA Member Countries in the Light of the Decisions of the 26th CPSU Congress," EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV, No 3, 1981, pp 44-47.
12. See: Logvinov, G. A., Pankratov, B. V., "Effective Form of Bilateral Scientific Contacts," VESTNIK AKADEMII NAUK SSSR, No 8, 1980, pp 63-69.
13. See: Tvrdik, Z., "Encouragement of Scientific-Technical Cooperation Among the SEMA Countries," VOPROSY EKONOMIKI, No 5, 1982, p 118.
14. See: Chukanov, O., "Integration as a Factor of the Intensification of the Economy of the CEMA Countries," KOMMUNIST, No 17, 1982, p 111.

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## UKSSR STATE PRIZES IN SCIENCE AND TECHNOLOGY AWARDED

### Prize Recipients Listed

Kiev PRAVDA UKRAINY in Russian 25 Dec 83 p 1

[Decree of Central Committee of Ukrainian Communist Party and UkSSR Council of Ministers: "On the Awarding of State Prizes of the Ukrainian SSR for Science and Technology for 1983"]

[Text] Having reviewed recommendations submitted by the Committee for State Prizes of the UkSSR in Science and Technology under the UkSSR Council of Ministers, the Central Committee of the Ukrainian Communist Party and the UkSSR Council of Ministers decree that State Prizes of the Ukrainian SSR for 1983 be awarded to the following:

### IN SCIENCE AND TECHNOLOGY

1. Yevgeniy Pavlovich Fedorov, academician of the UkSSR Academy of Sciences and senior scientific associate and consultant; Yaroslav Stepanovich Yatskiv, corresponding member of the UkSSR Academy of Sciences, director; Vitaliy Stepanovich Kislyuk, candidate of physical and mathematical sciences, deputy director; Dmitriy Pavlovich Duma, doctor of physical and mathematical sciences, laboratory chief; Alla Alekseyevna Korsun', candidate of physical and mathematical sciences, senior scientific associate; Antonina Nikitichna Kur'yanova, candidate of physical and mathematical sciences, junior scientific associate, workers at the Main Astronomical Observatory of the UkSSR Academy of Sciences; and Igor' Vladimirovich Gavrilov, doctor of physical and mathematical sciences (posthumously)--for the series of works: "Razrabotka teorii i prakticheskoye postroyeniye koordinatnykh sistem dlya geodinamicheskikh, selenodezicheskikh i kosmicheskikh issledovaniy" [Development of the Theory and the Practical Construction of Coordinate Systems for Geodynamic, Selenodesic and Space Research].

2. Petr Pavlovich Kuz'menko, doctor of physical and mathematical sciences, [VUZ] department chief; Yevgeniy Iosifovich Khar'kov, doctor of physical and mathematical sciences, professor; Vladimir Ivanovich Lysov, candidate of physical and mathematical sciences, laboratory chief; Valentin Yevgen'yevich Fedorov, candidate of physical and mathematical sciences, docent, workers at the Kiev State University imeni T.G. Shevchenko; Aleksandra Vasil'yevna Romanova, doctor of physical and mathematical sciences, department chief; Aleksandr Georgiyevich Il'inskiy, candidate of physical and mathematical sciences, senior scientific associate, workers

at the Metal Physics Institute of the UkSSR Academy of Sciences; Yaroslav Iosifovich Dutchak, doctor of physical and mathematical sciences, department chief; Viktor Yakovlevich Prokhorenko, candidate of physical and mathematical sciences, docent, workers at the Lvov State University imeni Ivan Franko; Vladimir Alekseyevich Alekseyev, candidate of physical and mathematical sciences, head of a group at the Atomic Energy Institute imeni I.V. Kurchatov; Zinoviy Aleksandrovich Gurskiy, candidate of physical and mathematical sciences, senior scientific associate at the Lvov Department of the Institute of Theoretical Physics of the UkSSR Academy of Sciences, for the series: "Eksperimental'nyye i teoreticheskiye issledovaniya po fizike zhidkikh metallov" [Experimental and Theoretical Research in the Physics of Liquid Metals].

3. Oleg Aleksandrovich Kremnev, academician of the UkSSR Academy of Sciences, deputy director of the Technical Thermal Physics Institute of the UkSSR Academy of Sciences, project director; Yuriy Sergeyevich Kravchenko, deputy chief; Nikolay Dmitriyevich Butskiy, deputy department chief, workers of the Experimental Technological Design Office of that institute; Viktor Markovich Olevskiy, doctor of technical sciences, deputy director; Mark Yefremovich Ivanov, candidate of technical sciences, laboratory chief, workers at the State Scientific Research and Planning Institute of the Nitrogen Industry and Products of Organic Synthesis; Boris Georgiyevich Kholin, doctor of technical sciences, deputy director of the Sumy Branch of the Kharkov Polytechnical Institute imeni V.I. Lenin; Boris Alekseyevich Klopovskiy, chief engineer at the All-Union Scientific Research and Design Institute of Chemical Machine-Building; Anatoliy Yefimovich Shevtsov, shop chief at the Azot Production Association imeni Lenin Komsomol in Severodonetsk; Grigoriy Samoylovich Pashchenko, shop chief at the Azot Production Association imeni Komsomol Ukrainy in Cherkassy; Sergey Konstantinovich Nazarov, department chief at the Stirol Production Association imeni Sergo Ordzhonikidze in Gorlovka, for the development and application of a technology for the monodisperse granulation of melts and new vibrating-granulation equipment for the production of mineral fertilizers at nitrogen industry enterprises.

4. Irina Aleksandrovna Dudka, doctor of biological sciences, department chief; Mariya Yakovlevna Zernova, doctor of biological sciences; Mariya Fedorovna Smitskaya, candidate of biological sciences, senior scientific associate, workers at the Botany Institute imeni N.G. Golodnyy of the UkSSR Academy of Sciences; Dmitriy Konstantinovich Zernov, academician of the UkSSR Academy of Sciences (posthumously); Semen Filimonovich Morochkovskiy, doctor of biological sciences (posthumously), for the five-volume, seven-book publication: "Opredelitel' gribov Ukrainy" [Identification Guide to Mushrooms of the Ukraine] (1967-1979).

5. Petr Petrovich Tolochko, doctor of historical sciences, department chief at the Archeology Institute of the UkSSR Academy of Sciences, project leader; Sergey Aleksandrovich Vysotskiy, doctor of historical sciences, sector chief; Yaroslav Yevgeniyevich Borovskiy, candidate of philology; Stefaniya Romual'dovna Kiliyevich, candidate of historical sciences, senior scientific associate; Gleb Yur'yevich Ivakin, Ivan Ivanovich Movchan, Mikhail Andreyevich Sagaydak, Viktor Aleksandrovich Kharlamov, junior scientific associates, workers at that institute; Konstantin Nikolayevich Gupalo, deputy director of the History Museum of the City of Kiev, for a series of scientific works on the history of medieval Kiev (1972-1982).

6. Aleksandr Aleksandrovich Sovko, corresponding member of the VASKhNIL [All-Union Academy of Agricultural Sciences imeni V.I. Lenin], deputy chairman of the



Presidium of the Southern Division of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin; Serafim Aleksandrovich Gladkov and Aleksey Yakovlevich Gasanenko, candidates of agricultural sciences, laboratory chiefs; Louiza Stepanovna Gasanenko, candidate of agricultural sciences, senior scientific associate, workers at the Ukrainian Scientific Research Institute of Irrigated Crop Cultivation; Vasiliy Semenovich Klyuy, candidate of economic sciences, deputy department chief in the Administration of Affairs of the UkSSR Council of Ministers; Nikolay Mikhaylovich Tereshchenko, candidate of agricultural sciences, department chief at the All-Union Plant Breeding and Genetics Institute; Vasiliy Zakharovich Tur, chairman of the Kolkhoz imeni Tatarbunary Uprising in Tatarbunarskiy Rayon, Odessa Oblast; Anatoliy Timofeyevich Demchuk, chairman of the Kolkhoz imeni Shchors in Dolinskiy Rayon, Kirovograd Oblast; Leonid Timofeyevich Smutchenko, director of the Limanskiy Sovkhoz of the Kherson Agroindustrial Association for the Production and Processing of Vegetables, Fruits and Grapes, for the development of advanced technology for raising seed, developing and introducing high-yield varieties of alfalfa for the Steppe Zone of the UkSSR.

7. Viktor Stepanovich Karpenko, doctor of medical sciences, director of the Kiev Scientific Research Institute of Urology and Nephrology, project director; Liliya Petrovna Pavlova, doctor of medical sciences, department chief; Aleksey Sergeyevich Pereverzev and Ivan Fedorovich Yunda, doctor of medical sciences, division chiefs; Georgiy Filippovich Kolesnikov, doctor of medical sciences, laboratory chief, workers at that institute; Aleksey Vladimirovich Lyul'ko, doctor of medical sciences, pro-vice-chancellor of the Dnepropetrovsk Medical Institute; Aleksandr Fedorovich Vozianov, doctor of medical sciences, [VUZ] department chief at the Kiev Medical Institute imeni Academician A.A. Bogomolets; Petr Stepanovich Sernyak, doctor of medical sciences, [VUZ] department chief at the Donetsk Medical Institute imeni M. Gor'kiy; Viktor Pavlovich Chernyshov, doctor of medical sciences, laboratory chief at the Kiev Scientific Research Institute of Pediatrics, Obstetrics and Gynecology imeni Hero of the Soviet Union, Professor P.M. Buyko; Vasiliy Ostapovich Kravchuk, division chief at the Volyn Oblast Hospital, for the series: "The Substantiation, Comprehensive Development and Introduction into Broad Medical Practice of Methods of Diagnostics, Treatment and Prevention of Diseases of the Postate Gland--Prostatitis, Sclerosis and Adenoma."

8. Aleksandr Abramovich Grando, doctor of medical sciences, director of the Medical Museum of the UkSSR; Anatoliy Vasil'yevich Utash, chief mechanic at that museum; Konstantin Ivanovich Kul'chitskiy, doctor of medical sciences, department chief at the Kiev Medical Institute imeni Academician A.A. Bogomolets; Vasiliy Danilovich Vilyk, doctor of medical sciences, chancellor of the Vinnitsy Medical Institute imeni N.I. Pirogov; Galina Semenovna Sobchuk, director of the N.I. Pirogov Homestead Museum; Sergey Sergeyevich Debov, academician of the USSR Academy of Medical Sciences; Sergey Ivanovich Goncharenko, artist with the Kiev Sculpture and Art Combine; Al'bert Moshkovich Kryzhopol'skiy, artist with the Kiev Monument and Decorative Art Combine; Nikolay Alekseyevich Khan, artist (posthumously), for creating the Medical Museum of the UkSSR, restoring the N.I. Pirogov Homestead Museum, and for the extensive popularization of the achievements of Soviet medical science and health practices.

9. Yuriy Aleksandrovich Sterenbogen, doctor of technical sciences and department chief; Svetlana Vasil'yevna Yegorova, candidate of technical sciences and senior scientific associate; Aleksandr Vital'yevich Yurchishin, senior engineer, workers at the Institute of Electric Welding imeni Ye.O. Paton of the UkSSR Academy of Sciences; Yuliy Israilevich Rubenchik, doctor of technical sciences and department



chief at the Volgograd Polytechnical Institute; Genadiy Alekseyevich Sal'nikov, general director of the Volgograd Production Association of Petroleum Machine-Building; Grigoriy Ivanovich Bublik, chief engineer; Fedor Mikhaylovich Yelkhimov, electric welder, workers in that association; Georgiy Ivanovich Nalche, candidate of technical sciences, department chief at the Zhdanov Metallurgy Plant imeni Il'ich; Grigoriy Antonovich Piven', shop chief in the Zhdanovtyazhmash Production Association; Arseniy Martynovich Makara, corresponding member of the UkSSR Academy of Sciences (posthumously), for the project: "Organizing the Production of Unique Welded Structures for the Gas and Petrochemical Industry, Based on the Development and Application of Highly Effective new materials and technological processes."

10. Mikhail Galaktionovich Novozhilov, doctor of technical sciences, department chief at the Dnepropetrovsk Mining Institute imeni Artem; Ernest Ivanovich Yefremov, doctor of technical sciences, deputy director of the Geotechnical Mechanics Institute of the UkSSR Academy of Sciences; Mikhail Vladimirovich Vasil'yev, doctor of technical sciences, director of the Mining Institute of the USSR Ministry of Ferrous Metallurgy; Yevgeniy Ivanovich Kikovka, candidate of technical sciences, chief engineer at the Ingulets Ore-Dressing Combine imeni 50th Anniversary of the USSR; Vladimir Lavrent'yevich Kolibaba, candidate of technical sciences, deputy administration chief of the USSR Ministry of Ferrous Metallurgy; Nikolay Maksimovich Panchoshnyy, director of the Northern Ore-Dressing Combine imeni Komsomol of the Ukraine; Ivan Ivanovich Savitskiy, director of the Southern Ore-Dressing Combine imeni XXV CPSU Congress; Anatoliy Vasil'yevich Andryushchenko, deputy chief engineer at the State Institute for the Designing of Enterprises for the Iron Ore Industry; Boris Nikolayevich Tartakovskiy, doctor of technical sciences (posthumously); Gavriil Makarovich Kitach, doctor of technical sciences (posthumously), for the development and extensive industrial application of a progressive flow-cycle technology at iron ore quarries of the Krivbass.

11. Aleksandr Sergeyevich Povarennykh, academician of the UkSSR Academy of Sciences; Yevgeniy Georgiyevich Kukovskiy, Aleksandr Lukich Litvin and Aleksey Nikolayevich Platonov, doctors of geological and mineralogical sciences; Ivan Vasil'yevich Matyash, doctor of physical and mathematical sciences, department chiefs; Arkadiy Nikolayevich Tarashchan, doctor of geological and mineralogical sciences, laboratory chief, workers at the Institute of Geochemistry and Mineral Physics of the UkSSR Academy of Sciences; Orest Ilyarovich Matkovskiy, doctor of geological and mineralogical sciences, department chief at the Lvov State University imeni Ivan Franko; Boris Semenovich Panov, doctor of geological and mineralogical sciences, department chief at the Donetsk Polytechnical Institute; Vladimir Antonovich Kalyuzhnyy, doctor of geological and mineralogical sciences, department chief at the Geology and Geochemistry of Combustible Materials Institute of the UkSSR Academy of Sciences; Yevgeniy Konstantinovich Lazarenko, academician of the UkSSR Academy of Sciences (posthumously), for the series: "Teoreticheskaya i regional'naya mineralogiya" [Theoretical and Regional Mineralogy]."

12. Vsevolod Grigor'yevich Lyutsay, doctor of technical sciences, deputy department chief, Engineering Science Institute imeni A.A. Blagonravov of the USSR Academy of Sciences, head of project; Viktor Sergeyevich Kornisyuk, director; Aleksandr Ignat'yevich Ivanitskiy, chief engineer; Georgiy Ivanovich Lutsenko, chief technologist; Vladimir Mironovich Smelyanskiy, chief of the central laboratory, workers at the Odessa Cable Plant imeni 60th Anniversary of the Great

October Socialist Revolution; Vitaliy Mikhaylovich Belous, doctor of physical and mathematical sciences, director of the scientific research institute of physics; Aleksandr Arkad'yevich Khanonkin, candidate of physical and mathematical sciences, chief of the branch scientific research laboratory; Yuriy Viktorovich Kovalev, department chief at the same laboratory, workers at the Odessa State University imeni I.I. Mechnikov; Nikolay Ivanovich Komyak, doctor of technical sciences, department chief at the Burevestnik Scientific Production Association in Leningrad; Yuriy Semenovich Morozov, candidate of economic sciences, deputy chief of the All-Union Production Association for the Production of Cable Products, for the development and introduction of physical methods of continuous monitoring of wire-drawing production in the cable industry.

#### FOR TEXTBOOKS FOR HIGHER EDUCATIONAL INSTITUTIONS

1. Kirill Dmitriyevich Pyatkin, doctor of medical sciences, senior scientific associate, and Yuriy Semenovich Krivoshein, candidate of medical sciences and department chief, workers at the Crimean Medical Institute, for the textbook: "Mikrobiologiya (s virusologiyey i immunologiyey)" [Microbiology (with Virology and Immunology)], published in 1980, (fourth edition).

2. Georgiy Grigor'yevich Yefimenko, corresponding member of the UkSSR Academy of Sciences and Ukrainian SSR minister of higher and secondary specialized education; Abram Anatol'yevich Gimmel'farb, doctor of technical sciences and department head; Vasiliy Yefimovich Levchenko, candidate of technical sciences and province-chancellor, workers at the Dnepropetrovsk Metallurgical Institute imeni L.I. Brezhnev, for the textbook: "Metallurgiya chuguna" [Iron Metallurgy], published in 1981.

#### B.Ye. Paton Comments on Prizes

Kiev PRAVDA UKRAINY in Russian 25 Dec 83 p 2

[Article by twice Hero of Socialist Labor, Academician B.Ye. Paton, president of the UkSSR Academy of Sciences and chairman of the Committee for State Prizes in Science and Technology of the UkSSR: "New Attainments in Scientific and Technological Progress"]

[Text] A decree passed by the Central Committee of the Ukrainian Communist Party and the UkSSR Council of Ministers awarding the 1983 State Prizes of the UkSSR for Science and Technology is published today, on the anniversary of the proclamation of Soviet power in the Ukraine. This document is further confirmation of the attention given by the party and the government to the work of the scientists and specialists, who are accelerating rates of scientific and technological progress in the industrial and agricultural branches of production and are contributing to the flourishing of culture and education and to the strengthening of the nation's defense capability with their achievements.

Among the numerous recipients are members of scientific and production collectives both in the Ukraine and at enterprises and establishments of Moscow, Leningrad and other cities of the Soviet Union, which clearly demonstrates the true friendship and cooperation of our homeland's peoples.

A fundamental work by scientists of the Main Astronomical Observatory of the UkSSR Academy of Sciences is highly evaluated. It is devoted to the successful resolution of an important scientific problem--the refinement and further development of high-precision terrestrial, lunar and space systems of coordinates and the pinpointing of the mutual arrangement of their support points and axes at any given moment. What is obtained not only makes it possible to perform astronomical studies on a new basis, but can also be used for the detailed mapping of the Earth, the Moon and other planets, and for the development of space navigation.

The Physicists have been given due credit for their work. The properties of liquid metal and melts have been studied in detail, and a number of new physical phenomena have been discovered. It should be noted that the results have been applied on a practical level. New alloys with neutron absorbers have been developed; fundamentally new, high-temperature thermocouples have been produced; and technology for producing aluminum alloys and hot, galvanized, rolled sheet metal, and other production processes have been improved. This is an example of the accelerated, practical adoption of the results of theoretical and experimental developments.

Another collective has confirmed this thesis. Scientists and specialists led by O.A. Kremnev, academician of the UkSSR Academy of Sciences, have provided new technology and equipment for obtaining mineral fertilizers in granules of uniform size. Fertilizers are being used more effectively as a result, and losses have been cut in transportation and storage. More than 2.5 million tons of fertilizers are produced annually with the new technology.

The biologists have also been awarded prizes. They include D.K. Zerov, academician of the UkSSR Academy of Sciences, and others. Scientists and workers in agriculture, forestry and health have a high opinion of their fundamental work: "Identification Guide to Mushrooms of the Ukraine."

The 1500th anniversary of the founding of Kiev was celebrated last year. Archaeologists have devoted many years to the study of blank pages in the history of one of our nation's most ancient cities. New information has been uncovered on its economic and cultural development in the 12th and 13th centuries, and unknown architectural monuments have been discovered. This has opened up prospects for the further study of the origins of ancient Russian cities, of their role and place in the development of international economic and cultural relations. The awarding of a prize to the team of archaeologists headed by Doctor of Historical Sciences P.P. Tolochko for a series of works on the history of medieval Kiev will be greeted by the general public with satisfaction.

The developers of a new technology for raising alfalfa for seed made a significant contribution to the accomplishment of the Food Program. New, high-yield varieties of this valuable feed crop have been given a start in life in many places. The economic effect just on the farms of our republic's Steppe Zone already exceeds 50 million rubles.

Prominent medical workers headed by Doctor of Medical Sciences V.S. Karpenko have been awarded prizes. Urologists have learned the causes and studied the mechanism

for the development of diseases of the prostate gland and have applied highly effective methods for diagnosing and treating serious illnesses. Treatment has been improved considerably, and thousands of people have returned to active work in production.

I want to mention those who created the Medical Museum of the UkSSR. Scientists and specialists have also re-embalmed the body of N.I. Pirogov. Skillfully selected displays acquaint visitors with means and methods used in folk medicine, beginning with its inception, with the work of well-known doctors and medical scholars of the past and the present, and with the creative ties linking the Ukraine's scientific medical schools with the other fraternal republics. The achievements of real public health in the Soviet nation are graphically demonstrated.

Cooperation between the Institute of Electric Welding imeni Ye.O. Paton of the UkSSR Academy of Sciences and enterprise workers and specialists, which has developed and introduced new materials and technologies for the welding, thermal processing and deformation of structural elements, are concrete confirmation of the strengthening of ties between science and production. All of this has made it possible to develop highly productive and reliable production equipment for the oil and gas, chemical and metallurgical industries within a brief period of time.

Volumms of minerals extracted by the open-cut method, including iron ore, are increasing by the year. Traditional methods of extracting and transporting the ore are not acceptable for working deep strata. The scientists and specialists have provided a new cyclical-flow technology for mining operations at the Krivbass iron ore quarries. The labor productivity of the miners has increased, and transportation costs have been cut by 42 percent. Around 33 million tons of ore is now being extracted each year by the new method at a saving of more than 15 million rubles.

The series of works, "Teoreticheskaya i regional'naya mineralogiya" [Theoretical and Regional Mineralogy], summarizes studies performed by the mineralogists with modern physical and chemical research methods, and define the basic mechanisms involved in performing the studies. The value of this work lies in the fact that fundamentally new criteria have been developed for exploration and the perspective assessment of mineral deposits, as a result of which previously unutilized kinds of mineral raw materials have been identified.

Science is helping to control and direct the production process. As result of developments by the scientists at the Odessa Cable Plant, the productivity of the production equipment in the manufacture of wire has been increased almost 4-fold, and product quality has been improved. The economic effect amounts to 25 million rubles a years.

Prizes have been awarded for the textbooks: "Metallurgiya chuguna" [Iron Metallurgy] and "Mikrobiologiya" [Microbiology]. Written by well-known scientists and teachers, the books are popular among VUZ students and instructors and are used by a broad range of specialists. The reissuing of the textbooks clearly demonstrates the success of their authors.

The awarding of State Prizes of the UkSSR for Science and Technology coincides with the end of the calendar year and provides a sort of summation of the achievements of the scientists and specialists in the resolution of pressing scientific and scientific and technical problems. It is gratifying to see that the significance of the works singled out for State Prizes of the UkSSR is growing and that the contribution made by the researchers and production workers to the successful accomplishment of the tasks outlined by the party is increasing.

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## ROLE OF SCIENCE IN IMPROVING PRODUCTION ANALYZED

Tallinn KOMMUNIST ESTONII in Russian No 12, Dec 83 pp 21-29

[A. Käärna, vice-president, Estonian SSR Academy of Sciences: "The Key Problem of Economic Development"]

[Text] The Main Factor of Intensification

Because of changes in business conditions in the 1980s, an urgent need has arisen for converting the economy from extensive to predominantly intensive development. A decrease in the growth rate of the most important production resources--fuel, raw materials and manpower--could retard development of the economy as a whole, were it not compensated by more effective use of resources. A certain decrease in the growth rate of capital investment, fixed capital and national income in the last two five-year plans indicates that we need to sharply increase the effectiveness with which available production resources are being used and hasten conversion of the economy to intensive development.

Emphasizing the exceptional importance of this task in the article "The Teaching of Karl Marx and Some Issues of Socialist Development in the USSR," Comrade Yu. V. Andropov writes: "Our concerns are now focused on raising the effectiveness of production and of the economy as a whole. The party and the Soviet people deeply understand the importance of this problem."

The main motivation behind growth in effectiveness of social production and labor productivity in the present business conditions is scientific-technical progress. Rapid introduction of scientific achievements and new equipment and technology into the national economy is making it possible to use productive resources more fruitfully and to achieve tangible growth in labor productivity.

Two basic directions can be conditionally distinguished in scientific and technical progress. The first is creation of equipment and technology of a fundamentally new type which would revolutionarily transform the technical base of production and sharply raise the productivity of manpower. This direction, which marks a new stage in the scientific and technical revolution, is typified by the broad introduction of robot technology, microprocessors, laser technology and biotechnology into industry and other sectors of the

national economy. The second entails improvement of existing equipment and technology and upgrading product quality; this direction absorbs a smaller amount of capital investments, and its economic impact is not too bad.

Fierce competition is now going on in these directions in the capitalist world between the leading industrial countries, which are trying not to fall behind in the areas which determine the technical countenance of modern industry. The desire to surpass one another in the development of science and technology and to introduce new equipment and technology into all possible spheres of their application faster and more widely can be explained not so much by considerations of prestige as by vitally important economic and political interests. He who falls behind in technological development will fall behind in everything else. A desperate race is under way in the production of robot technology and electronics between Japan, USA and developed capitalistic states of Western Europe FRG, England and France. As an example in recent years Japan has soundly taken the first place in the capitalist world in production of industrial robots. According to 1980 data, 69 percent of all industrial robots were employed in Japan (only 16 percent were employed in the USA); in this case their mean annual production is increasing by 40 percent: It is now 20,000 robots per year.

The CPSU Central Committee and the USSR Council of Ministers Decree "On Measures to Accelerate Scientific and Technical Progress in the National Economy" notes that development of science and technology has become one of the important directions of competition between the socialist and capitalist systems. It was back in the first years of Soviet rule that V. I. Lenin said that he who possesses better equipment, organization, discipline and machines will win this competition.

The present stage of the scientific and technical revolution is unique in that production capacities are acquiring universality and flexibility--that is, a capability for switching to production of new products without re-adjustment and cessation of production, and practically without the need for updating the equipment. Robot technology possesses precisely this flexibility, and it is opening up the widest possibilities for growth in labor productivity. By changing the controlled programs of robots we can switch them from manufacturing certain parts to producing others without installing new equipment. Robots provide a savings of manpower and cause significant growth in productivity.

Introduction of new technology makes the unemployment problem worse in capitalist countries, while in socialist societies the use of highly effective technology increases the public wealth and promotes more efficient use of manpower. Introduction of robot technology and microprocessors into production will reduce the society's total working time and make working conditions easier. Robots and electronics are replacing people in jobs that are physically hard and harmful to the health, and in controlled processes, where in terms of decision making speed they often surpass human capabilities. The "Basic Directions of the USSR Economic and Social Development in 1981-1985 and in the Period to the 1990" foresee development of the automatic manipulators (industrial robots) and built-in automated control

systems employing microprocessors and microcomputers, their wide application, and creation of automated shops and plants."

Technical progress in electronics means creation of continually more sophisticated automatic resources of labor. It may be assumed that microprocessors will be supplanted by nano- and picoprocessors that are thousands and millions of times more productive. Robots reacting to ultraviolet light and radioactivity and capable of "seeing," "hearing," "smelling" and so on will be created.

Large reserves for raising productivity are hidden in the improvement and spread of laser technology. Lasers are enjoying increasingly wider application in the cutting, welding and heat treatment of metals, in instrument making and even in household appliances. High productivity and a fast return of investments into equipment are also typical of laser technology. For example use of laser technology in the country's motor vehicle industry for the cutting, welding and heat treatment of parts will produce a savings of 10 million rubles and will conditionally release a hundred workers in the present five-year plan.

Over 100 manufacturing organizations are now participating in the specific-purpose scientific-technical program of the USSR State Committee for Science and Technology and the USSR Academy of Sciences, "Creation and Production of Laser Technology for the National Economy." They include the Physics Institute and the Special Design Bureau of the Estonian SSR Academy of Sciences which have developed several original lasers. The specific-purpose program foresees creation of integral robot-controlled and automated systems using laser technology, and shops and enterprises that will increase the effectiveness of laser technology by many times.

It may be said that biotechnology has caused a revolution in some sectors of production, primarily in agriculture and food industry. The industrial contribution of microbiology--acquisition of antibiotics, amino acids, enzymes and pheromones--is now universally known. Use of microorganisms and enzymes for industrial purposes reduces the production cycle and decreases environmental pollution.

Development of molecular biology and genetic engineering is opening up new, unprecedented possibilities for production of feed additives (complete protein, amino acids, vitamins, antibiotics, hormones and vaccines) and for selection of highly productive breeds of farm animals and high-yield varieties of plants resistant to frost and drought. Manipulation of genes and their synthesis are creating great prospects in medicine.

Our country's scientists have drawn up plans for development of biotechnology within the framework of the activities of the Interdepartmental Council on Physicochemical Biology and Biotechnology. These plans also include long-term research conducted by the Institute of Chemical and Biological Physics of the Estonian SSR Academy of Sciences and Tartu State University in the area of molecular biology and genetic engineering.



As was noted earlier, one of the directions of technical progress in production is what we refer to as flexible automation, which insures mobility of production apparatus, its efficient retooling for production of a different kind of product and swift change of article nomenclature.

Flexible automation is based on the use of industrial robots and microelectronics. While program-controlled machine tools and industrial robots are used on rare occasions in traditional technology, a flexible automatic complex is based on the operation of program-controlled automatic systems all fused into a single unit (machine tools, robot-manipulators, current production control, automated planning and design). Some components of such a complex already exist today. Their integration is making it possible to introduce flexible automation into entire shops and plants. An example of an operating shop of this sort can now be found at the Dnepropetrovsk Electric Locomotive Plant. It is equipped with machine tools and robots controlled by digital programs, and its warehouse and plant transportation are automated. Moreover all of the different sections of the shop are brought together by a computer system into an integral production mechanism. This system controls the shop, it performs current planning, and it organizes the delivery of tools and semifinished parts to the work stations. The writing of programs for machine tools controlled by digital programs has been automated. Within just a few minutes the shop can be switched to production of any of 370 parts indicated on its products list. Flexible automation makes it possible to organize efficient small-series production.

Processing industry puts out 80 percent of its articles in small series of 10 to 50 units worldwide, and naturally the associated production outlays are sometimes higher than the costs of large-series production. Flexible automation eliminates (in the economic sense, of course) this contradiction.

The CPSU Central Committee and USSR Council of Ministers decree on accelerating scientific-technical progress instructed the USSR Gosplan, the USSR State Committee for Science and Technology and the USSR Academy of Sciences to prepare all-union programs aimed at creating flexible automated processes and automated planning systems, and at introducing them into the national economy.

And so, revolutionary changes in science and technology resulting from the application of new principles developed by fundamental science are occurring in the first basic direction of scientific and technical progress. These principles are creating the prospects not only for unprecedented growth in labor productivity but also for sensible and effective use of the resources of production. Maximum utilization of these technical and economic possibilities is now the main task of our economy's development.

The possibilities for raising labor productivity in the second direction of scientific and technical progress--improvement of existing equipment and technology--are limited in economic respects. We can increase the output capacity of machines and equipment and improve some of their technical parameters and quality to certain limits. But from an objective standpoint

there exists an optimum level which, when exceeded, would result in faster growth of the cost of a unit of equipment usefulness (efficiency, output capacity, loading capacity) in comparison with the outlays. We are aware of sufficient examples from practical experience demonstrating that the value of a unit of machine's usefulness grows rather than decreasing as a result of technical improvements. For example in the last five-year plan the value of a unit of transformer output capacity increased by 29 percent, that of steam turbines increased by 22 percent and the value of a unit of motor vehicle loading capacity increased by 14 percent.

Hence follows this conclusion: While promoting scientific-technical progress by means of all resources simultaneously, we must place the emphasis on the first direction of progress--the widest use of fundamentally new equipment and technology. Herein lies the guarantee of converting the economy to intensive development, and of raising the effectiveness of social production.

#### With a Greater Payoff

A huge scientific potential has been created in our country, consisting of numerous scientific institutions, 50,000 planning and design organizations, experimental production subdivisions and numerous institutions of higher education, all of which are conducting extensive scientific research. In 1980 4.4 million persons were employed in science and services rendered to it; this included 1.4 million scientists. We have allocated up to 4.8 percent of the national income to development of science. There are over 200 scientific-production associations operating in the national economy. The cost of fixed productive capital exceeds 1.4 trillion rubles.

Industry assimilates hundreds of new machines and instruments every year; in 1982, 679 new kinds of equipment, devices, instruments and materials were introduced into series production, 145 new production processes were applied, and 366 automated control systems were placed into operation. This year we plan to achieve a 3.5 billion ruble savings due to technical progress, and to conditionally release about 2.4 million workers, including 850,000 in industry. The five-year plan includes 170 scientific-technical programs, implementation of which will mean many more new machines and equipment, and new materials and production processes.

However, as was noted in the CPSU Central Committee and USSR Council of Ministers decree, the organization of this work is not fully in keeping with the party's demand for really combining the advantages of our socialist structure and the achievements of the scientific-technical revolution. The problem is that in recent years fewer new types of machines, equipment, apparatus and measuring instruments have been supplied to industry. While in the 8th Five-Year plan an average of 4,254 units of such equipment were manufactured annually, the figure was 4,001 units in the 9th and 3,704 units in the 10th. The corresponding planned quotas remained unfilled for a number of years.

The economic effectiveness of new equipment sometimes leaves something to be

desired. Evidence of this can be found in the fact that every percent increment of national income requires the addition of productive capital, which increases at a rate that exceeds the desired increment. For example a 1 percent increment in national income required a 1.4 percent increment in productive capital in the 9th and partially in the 10th five-year plans.

Production is too slow in absorbing from science those new achievements which would make it possible to enjoy tangible growth in labor productivity and an increase in product quality. For example in the first year of the past decade (1971-1980) only 20 percent of the models of new equipment recommended for series production were actually placed in series production; the figure for the 2nd year was 30, and in the 3rd it was 18 percent. One of the reasons for this slowness lies in the insufficient economic interest of enterprises in quickly applying scientific achievements and updating production. The system for evaluating the results of the business activities of enterprises does not adequately stimulate the faster development of new production processes, equipment and materials.

Interesting in this regard is a statement made by Ya. P Ryabov, chairman of the USSR State Committee for Foreign Economic Relations, who notes that given the present rules and techniques for forming prices and the economic stimulation funds, it is more profitable for enterprises to produce old equipment in a well-organized production process, since in this case owing to certain imperfections in the existing system of economic stimulation they enjoy higher profit indicators and deductions into their funds. Production of new equipment requires alteration of the production processes, manufacture of new tools, replacement of equipment and additional outlays in the period of preparations for and assimilation of production. It also worsens the indicators of the enterprise's activity. This is a pressing problem, one which can naturally be solved not only by reinforcing discipline and raising the sense of responsibility of designers, producers and planners, but also by improving economic stimulation and price formation.

Under socialist conditions scientific-technical progress is guided according to a plan at achieving the socioeconomic goals of the society. In keeping with the national economic plans, resources are used primarily in the priority directions of scientific-technical progress, those insuring development of the material-technical base of the economy, growth of production effectiveness and solution of urgent socioeconomic problems.

The procedure for planning development of science and technology was supplemented by several new elements in recent years. The most important among them--development of specific-purpose scientific-technical programs and their inclusion into the state plan of economic and social development--are balanced with other subdivisions of the plan. Use of the specific-purpose program planning method permits better integration of the scientific potential with technical production possibilities.

The CPSU Central Committee and USSR Council of Ministers decree demands that we expand the planning of scientific and technical development on the basis of specific-purpose programs. Beginning in the 12th Five-Year Plan, we will write the following programs for solving the most important scientific-technical problems:

all-union programs, the principal refinements of which must be included in state five-year and annual plans of economic and social development;

republic (interrepublic) programs, the assignments of which are subject to inclusion in five-year and annual plans of the union republics;

sector (intersector) programs, to be included in the plans of the corresponding ministry;

regional and territorial complex programs, which are also to be included in state plans.

Planning based on specific-purpose programs was already employed in the past five-year plan, and is being employed in the present plan, but the next five-year plan will be unique in that the programs will be supported with resources on a planned priority basis, which will insure unconditional fulfillment of the assignments contained in these programs.

Under the guidance of the Estonian SSR Academy of Sciences, scientific-technical programs are being written to solve a number of important technical problems and socioeconomic problems specific to the republic. These problems are associated with integrated use of our minerals--shale and phosphorites, with environmental protection and with long-term forecasting of economic and social development. Our republic's scientific institutions are actively participating in major all-union scientific-technical programs. Work in laser technology, biotechnology, fine organic synthesis and automated and computer systems based on microprocessors is proceeding successfully.

Concurrently with expansion of specific-purpose program planning, the forces and resources of scientific institutions are undergoing further concentration and unimportant research topics and redundancy are being eliminated. The republic's academy of sciences has already taken some steps: More than half of its resources are now involved in program research.

To strengthen cooperation between science and production, we must strengthen their binding links. Most important among them is the experimental base, which is weak as yet in both production enterprises and scientific institutions. Analysis has shown that scientific institutions which do not possess their own experimental base submit to production 2.5 times fewer results not requiring reworking than the quantity of results submitted by institutions possessing such a base. But it is true that a more substantial effort has been made in recent years to solve this problem. As an example in 1975-1982 outlays within the USSR Academy of Sciences on design and experimentation increased over three times faster than did outlays on science in general. During this same period the number of employees of the republic's academy of sciences working at this level increased by 57 percent, while outlays grew by 131 percent.

Concurrently expansion of experimental production has the major effect of encouraging production of new and improved items at industrial enterprises. The party and government decree foresees measures by which to surmount the lag in this area. Assignments for construction of experimental bases and production operations are being included in five-year and annual plans on priority; moreover assets allocated for this purpose cannot be utilized for any other purpose.

#### Scientific-Technical Progress and the Economic Mechanism

Practical utilization of scientific achievements depends on many factors, beginning with technical and ending with psychological. The economic factor is of no small importance as well. Discussing the reasons behind the slow rate of introduction of the achievements of science and technology into production, Comrade Yu. V. Andropov notes that the main reason is that the economic mechanism and the forms and methods of economic control are failing to satisfy the requirements imposed upon them by the attained level of Soviet society's material-technical, social and spiritual development. It was emphasized at the November (1982) Plenum of the CPSU Central Committee that the planning methods and the system of material stimulation must promote unification of science and production. Those who boldly accept the challenge of introducing new technology must not find themselves in an economically disadvantageous position.

The system for controlling the economy and planning and the economic mechanism are called upon to insure maximum use of the scientific-technical potential; otherwise some of the resources invested into its creation would go to waste. Economic practice attests to the presence of many unutilized possibilities. Moreover some rules regulating economic activities are not just failing to promote technical progress: They are even retarding it.

The socialist economic system provides a possibility for directing scientific-technical progress in centralized and planned fashion. The existing system of planning science and technology is organized as follows: first, long-range scientific-technical forecasts (the 20-year integrated program of scientific-technical progress and the basic directions of socioeconomic development for a 10-year period); second, scientific-technical programs and other assignments of the five-year plans aimed at solving the major problems of science and technology; third, the basic assignments associated with development and assimilation of new equipment and production processes, and the basic indicators of the technical level of production and of products in annual plans.

Practical implementation of this basically logical system is not always smooth sailing. The main difficulty involves how to organically tie in the plan's assignments for accelerating scientific-technical progress with other divisions of the plan, and how to balance them with the resources necessary for fulfilling these assignments. Assimilation of new technology often drags on not only due to a shortage of materials and manpower but also because of the absence of free production capacities. In accordance with the decree, beginning with next year the ministries will be obligated to have their plans

foresee extra output capacities which could be used to assimilate new types of equipment and materials.

When the plan's assignments are substantial, transition to production of new articles may cause the production operation to fail its planning indicators, to include those which are used at the enterprises to form material incentive funds. From now on this contradiction is to be resolved by creating the necessary reserve of production capacities and of material and financial resources. Noteworthy in this regard is an experiment with new management rules being conducted in a number of union and republic ministries. As an experiment, the decree permits certain scientific-production associations to plan their own activities in the "science and scientific services" section. This means for example that gross production quotas are not prescribed for the scientific-production associations. Thus the administration is given room to maneuver output capacities and resources with the purpose of bringing production up to date.

There is one more objective contradiction, one that is not at all easy to resolve, in the planning and economic stimulation of the development of science and technology. By its nature, scientific-technical creativity is characterized by a longer span of time than, for example, current business activities. And this is understandable, since after all, development of technical innovations requires a great deal of time. The cycle from fundamental research to series production is from five to seven years in the best case. Moreover innovations (new technology for example) make their impact only following a long period of time, and at their introduction stage they require major outlays. As a rule new technical concepts are incompatible with *khozraschet* because they do not provide a quick return.

Two criteria are used today in business practice. First we have planning oriented on long-range results--indicators of minimum corrected outlays and the maximum national economic impact, though we are still lacking in our abilities to determine the latter. Second, we have *khozraschet*, which operates on the basis of indicators such as profit, profitability, cost and so on, which account for the local, short-term return, and which of course cannot reflect the entire national economic impact. But only the latter can serve as a real economic criterion and reference point of technical progress.

The solution to the problem lies in making the criterion used to evaluate the current business activities of an enterprise compatible with the criterion used to evaluate long-range scientific-technical concepts. This could become possible, were we to make the former an expression of the latter. Research by many economists shows that the indicator of an enterprise's net income could serve as such a combined criterion, were we to concurrently alter the procedure of profit distribution. An experiment with such a criterion should either confirm the reality of the theoretical recommendations or reject them.

Obviously in the future the entire economic mechanism will have to be based on a single foundation, one which would create conditions, stimuli and economic levers which would be equitable in relation to all production activity, on the basis of the maximum national economic impact. On their part, it is about

time for scientific economists to pay their debt to the producers: They must develop a dependable procedure for determining economic effectiveness. There are now about 70 such procedures resting on completely different methodological grounds. For this reason the results of measuring impact vary within 1 and 20. Judging from everything, the procedure presently being developed will be an improvement upon all former procedures.

The main economic indicator is price, which is used to calculate economic impact, profit, profitability and other cost indicators. The recent price reform was a serious step on the road to stimulating production of new equipment through prices. The wholesale prices introduced as of 1 January 1982 provide for higher profitability for new, progressive articles, while on the other hand halving the profitability of obsolete products, in comparison with normal profitability. Additions to the price of new products have been doubled as well.

A new procedure was approved for determining prices on new equipment and the standards of net production. The limiting price used in the planning and design of new equipment is employed in this procedure as the future wholesale price of the new article. Planning and design organizations are oriented from the very beginning on the new price and on the possibility it embodies for raising economic impact. The client and manufacturer negotiate the limiting price, while simultaneously working out the economic impact more specifically. During the first year that a new product is manufactured, its cost to the enterprise is higher than in the second and third years of series production. A procedure has now been introduced according to which the difference is to be compensated by a unified fund for development of science and technology. The decree foresees measures intensifying the influence of prices on technical progress. Incentives of up to 30 percent of wholesale prices on new, highly effective products and deductions of the same amount on prices of products subject to removal from production are being established.

Technical progress requires additional outlays; to cover them, the enterprises need financial and material resources. An enterprise's finances may rest on three sources: 1) the state budget, 2) bank credit and 3) khozraschet profit. It would obviously be suitable to make corrections in the existing structure of the sources used to cover outlays by raising the role of khozraschet income and bank credit. In 1980 the structure of financing sources in the republic's industry appeared as follows (percentages):

Centralized capital investments	33.1
Production development fund	18.1
New equipment fund	5.1
Unified fund for development of science and technology	4.3
Gosbank loans	9.3
State budget	4.7
Other sources	25.4



We have thus far observed a tendency toward a lower proportion of assets from the production development fund and from bank credit, and a greater role for the unified fund for development of science and technology. The shift in center of gravity to khozraschet activity and the profits of such activity is raising the economic responsibility of enterprises and their interest in technological innovations, and it is orienting them on only the economic effectiveness of innovations. Higher economic organs must also possess resources with which to support technical and technological measures of importance on a national or sector scale. In compliance with the decree, the USSR State Committee for Science and Technology is creating a reserve of assets by taking deductions from the unified funds for development of science and technology (up to 1.5 percent).

The system for evaluating the economic activities of enterprises needs improvement. Discussing the existing system, Comrade Yu. V. Andropov noted at the November (1982) Plenum of the CPSU Central Committee that enterprises are being dealt with strictly for failing the production plan while going almost unpunished for poor introduction of new technology. When wholesale prices on new products do not compensate for outlays on their assimilation and when the other indicators of an enterprise's economic activities do not reflect the usefulness of the given innovation, the stimulation funds and, in the end, the entire collective suffer. This does happen often in fact.

The main criteria used to determine the standards for creating stimulation funds are now growth in labor productivity, the proportion of products in the top quality category and fulfillment of contracted obligations (depending on the particular features of the industrial sector, other criteria may include the indicators of resource economization, growth in the output-capital ratio, profitability, cost reduction and production volume in natural terms).

Assimilation of new products during preparations for production and in the first year of their series production involves traditional outlays and, possibly, an increase in the proportion of labor, capital and materials required (in comparison with the indicators of previous production). Consequently a worsening occurs in the results used as the basis for determining the sizes of stimulation funds and the conditions for paying bonuses to workers and administration. Some calculations show that if the proportion of new products at an enterprise (in the first and second years) is 25 percent, then the total production volume would be 12.5 percent less than the volume existing prior to the transition to production of the new articles.

It is the duty of scientists to develop procedures that would make it possible to reflect updating of products (technology, production processes) and the socioeconomic effectiveness of new articles (economic impact, improvement of working conditions, fuller satisfaction of social needs) in the standards used to form stimulation funds, and in general in the indicators of the economic activities of enterprises. In addition to improving wholesale prices, there are other ways as well. For example the production volume of enterprises assimilating new articles should be planned with a consideration for the use of production capacities on the basis of the appropriate standard coefficients calculated as the proportion of gross production represented by innovations.



This procedure would make it possible for enterprises to maneuver their productive capacities with the purpose of updating their products.

We should make bolder use of what is referred to as destimulation--that is, economic sanctions imposed in the case of failure to fulfill a quota for new product assimilation. The CPSU Central Committee and USSR Council of Ministers decree foresees a decrease of not less than 25 percent in the bonuses paid to the executives of associations and enterprises if the quotas for assimilation of new technology and production processes are not filled, and if the manufacture of certain products is allowed to go on beyond the standard deadline for their updating.

It would be important to increase the economic dependence between the developers of new technology--the scientists and designers--and those who assimilate this technology--production executives and process engineers.

The main motive encouraging the scientist to introduce his results is moral satisfaction from the fruits of his labor and considerations of prestige, and not at all material interest. Designers and other developers of new technology may be rewarded by adding an incentive markup to the wholesale price, paid for out of the material stimulation fund. This possibility is rather limited, and the bonus has an insignificant stimulatory action. The developer can count on the added bonus only some time after the lengthy process of assimilating the innovation, which may drag on for many years.

The decree introduces one-time bonuses of 3,000 to 40,000 rubles for raising the material interest of the persons participating in the creation and assimilation of highly effective technology, production processes and new materials. The ministry has granted the right to permit payment of bonuses to executives, engineers and technicians above and beyond the maximum established bonuses for introducing new products and increasing their proportion in the total production volume. Technological development also depends to a great extent on the participation of consumers in development of the technical and economic parameters. Therefore the decree foresees that manufacturers must consult with consumers before developing the type-sizes and families of machines and equipment to be produced over the long term. The quotas for developing new products or modernizing products already in production, for initiating production or for halting manufacture must also be coordinated with the consumer. Consumers and manufacturers must jointly approve the preliminary plan, which should contain the consumer's proposals concerning the technical-economic indicators of the new article. Concurrently the consumer is being made materially liable for refusing to accept machines and equipment created at his request.

#### Urgent Tasks

The CPSU Central Committee and USSR Council of Ministers decree poses major tasks that must be completed by the scientific institutions of our republic, primarily the academy of sciences, and by the ministries, production associations and enterprises. The academy is called upon to raise the effectiveness of research and to actively encourage scientific collectives to broadly introduce the achievements of science into production.

Measures implemented in the last decade with the purpose of concentrating forces and resources on specific-purpose research programs aimed at solving the most important technical-economic problems are bearing their fruits. The practical results of a number of studies have been so substantial that they can be used as the basis for organizing production both here in our republic and beyond its borders. For example the design and manufacture of the first models of original lasers by the Estonian SSR Academy of Sciences was so successful that their series production could be started at any enterprises. The processes for obtaining some products of fine chemistry--for example prostaglandins, pheromones and so on--have been developed and tested to such an extent that organization of their industrial production has become a fully real possibility.

The design office of our academy of sciences has created various apparatus and measuring instruments (a seed dryer temperature control device based on microprocessors, a milk analyzer, micromotors, chromatographs of various types and so on), production of which would no longer be feasible within the academy. Finished experimental models and the production processes must be submitted to industry for series production in the shortest time possible, and the highly qualified personnel of our design office must be encouraged to seek new technological concepts. Unfortunately it cannot be said that industry has displayed any great interest in our results.

Striving to hasten the application of the fruits of scientific research in the national economy, the Estonian SSR Academy of Sciences is developing experimental production. Plans are being made to significantly expand the experimental plant of the Institute of Chemistry, so that production of the chemical products named above could begin. However, it would hardly be reasonable to transform a center of fundamental research--the academy of sciences--into a semi-industrial organization. The principal direction of its work must continue to be improvement of our republic's production structure with the purpose of achieving application of the most substantial results of the scientific institutions. This must be considered when we draw up long-range plans for the economy's development.

The drafting of an integrated program of scientific-technical progress in our republic for the next 20 years has been completed. The program foresees reequipping of industry, agriculture and other economic sectors of the Estonian SSR, the basic directions for development of new technology and production processes in the national economy, the structural changes in the economy resulting from scientific-technical progress and fuller utilization of our republic's scientific-technical potential in production development.

The republic's economy depends to a significant extent today on imported technology and production processes. Our own potential is limited in this regard. We possess few enterprises which could produce new resources of labor for other enterprises in the republic or for other sectors of the national economy. Because of the peculiarities of its structure, we cannot rely fully on scientific potential as the technical motive force behind production. Therefore in addition to developing technical and technological research, we must try to make maximum use of those fruits of science which can now be implemented quite realistically.

Acceleration of scientific-technical progress means more than the fastest and fullest possible use of the results of science.

In our republic, where there are many old industrial enterprises, it is especially important not to simply replace machines and equipment by new articles but also to introduce technology and production processes based on new technical principles and insuring a sharp rise in labor productivity. The rate at which obsolete equipment is being written off has decreased and depreciation deductions for overhauls have risen recently in our republic, as well as throughout industry in the country. This means that we must concern ourselves with finding the optimum rate for replacing worn equipment and preventing obsolescence of production capacities. As a result we would be able to economize on resources spent on numerous equipment repairs and reduce the number of repairmen employed. Moreover modern methods must be employed when making repairs, so as to raise the reliability of parts. This would require an increase in the assets available to the enterprises; for example they could be permitted to spend 20 to 30 percent of their depreciation deductions on acquisition of new equipment and updating of machinery and equipment.

Despite the difficulties experienced by enterprises and associations in developing their plans for technical development, and the even greater complexities of implementing these plans, a much more energetic effort must be made. Every enterprise must have a strategic and a tactical plan of technical development covering a period of 10-15 years and foreseeing technical renovation and improvement of their production machinery and processes, growth in the technical level of production and renewal of the assortment of articles produced.

The enterprise administration is called upon to actively fight to implement this plan. Subjective energy, the capability for pushing projects through and purposeful activity in this direction are among the most important conditions which would prevent postponement of work to the last possible moment--that is, just before the point where the technical base of the enterprise has become so obsolete that completion of the planned assignment would be jeopardized. This is of course not one of the easier tasks, inasmuch as acquiring new technology, financial resources and materials sometimes requires self-sacrificing effort when they are scarce. On their part, the ministries can and must encourage their enterprises to pursue an active and well-conceived technical policy.

The economists--the theorists and practical workers who possess rich experience and whose knowledge of economic theory is high--are also called upon to make their contribution to accelerating scientific-technical progress. More room must be devoted to the economic problems of scientific-technical progress in the research programs of scientific institutions and VUZ departments. Our republic's scientific economists could also work more actively on problems such as planning indicators adapted to specific production conditions, the standards of economic stimulation of technical progress, economically justified prices on new equipment and on products in the top quality category, economic effectiveness of new technology and production processes and so on. Or why not, for example, develop and test out new forms and methods of economic stimulation of the introduction of scientific achievements? Some work has

already been done in the area of improving the mechanism of economic regulation of scientific-technical progress, but we still have the strength and possibilities for investigations of larger proportions.

Questions such as proper allocation of outlays on scientific-technical measures, the economic impact resulting from them and the results of the economic activities of enterprises from the standpoint of technical progress (growth in profits from scientific-technical innovations, cost reduction, relative economization of manpower, savings of fuel and materials, growth in labor productivity) provide food for analytical thought to economists employed by the enterprises. Consideration of the increments of normative net product obtained as a result of technical renovation of production makes it possible to assess economic activity more precisely from the standpoint of technical progress.

The role and responsibility of economists in determining the economic effectiveness of technical and technological innovations at enterprises should be raised. Under certain conditions, not all innovations provide an economic return. Therefore economists must have a substantial say in evaluations of their feasibility and their ability to provide an economic return.

The road of scientific-technical progress is rocky. The most serious obstacle on this road, the one most difficult to surmount, is the inertia of economic activity, stereotypic economic thinking that has outlived its time. The root of this problem lies in the historically evolved production potential, together with its obsolete technical base and organizational structure. The revolution in science and technology dictates the need for radical change of both the base itself and its structure. This is not an easy thing to do, since in addition to technical reconstruction and modernization, we must alter the way people have become accustomed to thinking, we must change their habits; to put it another way, we must "modernize" the business executives and producers themselves. Human conservatism is many times harder to surmount than technical conservatism. But this problem could be surmounted by using all means to encourage dynamic innovation in the people and the society.

Production executives must reject immediate interests--the first sign of narrow economic thinking. Fulfillment of daily and monthly planned assignments and their support with existing technology and production processes must be the goal of routine administrative activity. At the same time the production executive is obligated to display initiative in reconstructing the technical and technological base, and make long-term decisions. Technical progress in every specific production operation depends on a competent combination of these two aspects of administration. This has a bearing upon business executives of the highest rank as well.

Finally, our propaganda and our resources for shaping public opinion must also be oriented on the future, on scientific-technical progress.

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## MONOGRAPH DISCUSSES MANAGEMENT OF SCIENTIFIC AND TECHNICAL PROGRESS

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[Article "Comprehensive Management of Scientific and Technical Progress."  
This article is a chapter reprinted from a collective monograph "Khozyaystvennyy mekhanizm funktsionirovaniya sotsialisticheskoy ekonomiki" [The Economic Mechanism in the Functioning of a Socialist Economy], edited by academician N. Fedorenko and doctor of economic sciences N. Petrakov and prepared by the Problem Commission for Multilateral Cooperation Between the Academies of Sciences of the Socialist Countries "Questions of Improving Planning and the Management of the Economies in the CEMA Member Countries," Moscow, Izdatel'stvo "Ekonomika" 1982. Coordination work on the excerpt here published was done by doctor of economic sciences (V. Marshall) (GDR) and D. L'vov (USSR)]

[Text] The basic directions in improving the existing system of national economic planning and management have been defined in the decisions of the communist and workers parties of the socialist countries. The chief of these have been named as directions that focus all planning and management activity on improving efficiency and quality and on satisfying more fully and comprehensively the constantly growing requirements of the workers in the socialist countries. In order to accomplish this there is no other way but the intensification of production and the broad introduction of scientific and technical achievements and leading experience in the national economy.

The switch to a predominantly intensive path for economic growth insures the dynamic and proportional development of production and improvements in its ultimate efficiency.

The stimuli for scientific and technical progress are born out of the dialectic interconnection between production and consumption. The constant growth and expansion of requirements in a socialist society stimulates the mastery of new and improved output and the reequipping of the material-technical base on a new technological and organizational basis. The interconnection between production and consumption is based on the principle of planning, which makes it possible to effect purposeful transformations within the system of material production such as insure increased rates and scales in the realization of scientific and technical achievements in production. The forms in which these transformations are accomplished are constantly changing.

When demand greatly exceeds the opportunities for satisfying it, production is developed mainly in the direction of expanding its scales, increasing capacities, and introducing more productive equipment, which makes it possible to build up output volumes at rapid rates and reduce production costs and so forth. Here, economic growth is achieved mainly through mass production of new equipment already available, existing technologies and so forth. All the scientific and technical achievements incorporated in production at that moment are used in a planned way with increasing efficiency.

As demand is largely satisfied, however, signs appear that the possibilities of existing equipment are becoming largely exhausted. Further development of production along this path is not promising. The main reason for this is the "exhaustion" of the economic possibilities of existing equipment whose technological principles are obsolete and no longer capable of satisfying specific demand on earlier scales, let alone capable of being "adapted" to satisfy new demand. Under these conditions, forms of scientific and technical progress associated with the introduction of fundamentally new equipment and the realization of new technologies are moved to the forefront. Production starts to be restructured in a planned way on a new material-technical base and extensive use of the achievements of the scientific and technical revolution. At the present stage this kind of restructuring is being done in the following main directions:

--Extensive introduction of comprehensively automated technological processes and devices based on automatic data processing and programed regulation and coordination of all stages in the production of output. On this basis the liquidation of heavy physical and monotonous labor and labor injurious to the health is insured. This process promotes the all-around development of the individual during the course of labor activity and at the same time makes a significant contribution to raising the quality characteristics of the output produced. The latter is achieved through the comprehensive automation of production on a new technological basis that insures the completion of isolated operations and the process as a whole with a greater degree of reliability than achieved through the use of manual labor. The productive force of labor is substantially improved here.

--Expanding the sphere of application for microelectronics, which during the past 15-20 years has become the basis of control for today's equipment. This leads to a tangible saving of live labor, materials and energy and better utilization of production capacities.

--forming an energy-supply system that incorporates new energy sources (nuclear, solar, geothermal and so forth), and new forms of energy conversion and transmission over great distances, and also the extensive introduction of technologies and devices that insure a substantial reduction in energy-intensiveness in production.

--The increasingly decisive use of biological principles of action, based on the use of biological catalysts. These methods are already extensively used in the production of beverages and in pharmaceuticals. A new field of application has recently been found for them which has a great future, namely in the production of protein-rich fodders. The advantage of such processes is that they take

place in normal atmospheric conditions and hence, in contrast to many methods used for the chemical conversion of substances, they require neither the consumption of energy to achieve high temperatures nor major expenditures to fabricate pressure reactors.

--Deliberately altering the properties of materials. The possibilities being opened up in this regard by molecular physical chemistry are truly immense. Industry is now able to use material with given prespecified properties, and this insures the most economical consumption of resources and the development of high-quality output corresponding most closely to consumer needs, and so forth.

In the restructuring of the material-technical base for production on the basis of fundamentally new equipment and technologies, the following circumstances must be taken into account.

First, the great influence exerted by scientific and technical progress on the structure and dynamics of the material-technical bases in sectors in both the production and nonproduction spheres. The achievements of science and technology are now penetrating increasingly extensively into all fields of the national economy. Scientific and technical progress is becoming a major factor in insuring the dynamic and proportional development of the economy on the basis of intensification. It is beginning to depend increasingly on the readiness of the production apparatus to replicate scientific and technical achievements on a large scale, on not only the national but also the international scale. This reflects the connection between the system of expanded reproduction and scientific and technical progress. In order to maintain this interconnection a corresponding economic mechanism for management is required that insures acceleration in the introduction of scientific and technical achievements in the national economy.

Second, a rapid renewal of the production apparatus takes place on the basis of the latest achievements in science and technology. This presents its own often very complex demands on production planning. These demands include the fact that it is necessary to insure high mobility for the material-technical base of production and its adaptability to the rapid restructuring of technologies and the systems used to manage and organize production. New spheres in the application of scientific and technical progress such as the comprehensive automation of production on the basis of microelectronics and robot technology are called upon to play a major role here.

Third, determining the main directions in scientific and technical progress acquires the greatest of importance. In accordance with these directions there should be a planned reallocation of resources between individual spheres of scientific and scientific-production activities, personnel training and retraining and so forth. One effective way to realize this kind of restructuring in production is to develop comprehensive programs for scientific and technical progress. With their help, balanced changes are insured in the sector structure of the national economy and a planned transfer of the economy to a new and higher level of scientific and technical development that insures that the best final effect is achieved in social production as a whole.



Fourth, the structural shifts in the economy evoked under the influence of scientific and technical progress result primarily from the change in the qualitative level of output produced (both the means of production and objects of consumption). Here, the rise in quality affects not only the change in the structure of the sectors in the national economy but also the degree of balance in production. In the final analysis this dialectical process is seen in the fact that scientific and technical progress by acting on quality alters the existing structure of the sectors in the national economy and leads to the stabilization of a new structure that is more efficient from the social standpoint. In this process a substantial role is played by those parameters of quality in output that reflect reliability and the other characteristics that directly affect the technical-economic indicators for the sectors that are consumers of new output.

Fifth, scientific and technical progress exerts a direct affect on labor by altering its function and qualitative basis and freeing the individual from heavy physical labor.

Sixth, when considering the role and place of scientific and technical progress in a system of expanded reproduction it is essential to take into account the limited nature of the opportunities available to any single country in isolation in the business of rapidly introducing the best achievements of world practice into production. Obviously, forms of planned organization for the assimilation of new equipment acquire very great importance within the framework of all countries in the socialist community, based on international specialization and production cooperation.

In our view, the features enumerated above should also be reflected in planning scientific and technical progress and providing incentive for it. Here it should be noted that during the initial stages of the restructuring of the production apparatus on a new technical basis reflecting the latest achievements of science and technology, growth rates for the economy as a whole and for individual parts of it may decline. And this must be done so as to obtain in the very near future an enormous economic advantage and growth in the final effect of production. This factor should also be reflected in the economic mechanism for the management of scientific and technical progress.

#### Features of the Management of Scientific and Technical Progress.

The economic mechanism for the management of scientific and technical progress is an integral part of the overall economic mechanism for the functioning of the economy. In this connection, the underlying principles in the management of scientific and technical progress in the main and in the important essentials reiterate the principles of the overall economic mechanism. At the same time, management in this field is characterized by a number of special features.

One distinguishing feature in the management of scientific and technical progress is its goal-oriented focus on the realization of socioeconomic goals set by the plan for economic development. The list of scientific and technical problems is drawn up in accordance with the targets in the long-term plan for economic and social development. Without their resolution under the conditions



of the existing situation with regard to economic resources, these targets will simply not be met. The choice of problems is predetermined, on the one hand, by the existing amount of forward-looking scientific and technical work already completed, and, on the other, by the difference in the effectiveness of possible ways of realizing this work in a planned, dynamic manner. The first condition is in the nature of a constraint while the second acts as a generalizing criterion for scientific and technical progress. This is why the first special feature in the mechanism for management of scientific and technical progress is also comprised of realization of the requirement for improving production efficiency and increasing the return from each unit of available economic resources. However, growth in ultimate efficiency can also take place through factors not directly associated with scientific and technical progress. Hence the problem of distinguishing in overall growth the effectiveness of that part which is derived from the introduction of the achievements of science and technology in production. In this connection great significance attaches to methodological questions in the evaluation of the economic effectiveness of scientific and technical progress. It is a matter of developing a noncontradictory system of criteria showing the effectiveness of introducing scientific and technical achievements at various levels of production management.

The experience of economic building in the socialist countries shows that the lack of such a system in practical planning for the development of science and technology acts as a brake on the rapid realization of scientific and technical achievements in production.

A second and no less important feature of the management of scientific and technical progress is that a high final effect from the realization of scientific and technical achievements can also be achieved merely by making the scope of technical progress cover all the interlinked stages of production. High indicators for the introduction of new equipment in individual sections of production can be nullified by losses in other sections. This means that the approach to the introduction of new equipment should always be comprehensive, from the standpoint of a production system as a whole and from an evaluation of the possibilities for simultaneously improving all its parts and elements. And this in turn presupposes a need for structural shifts in production. Thus, the realization of scientific and technical achievements at the level of the national economy as a whole or at the level of intersector complexes is always accompanied by a frangibility in the existing structure for the sectors of the national economy and by change in the links existing between them. This kind of restructuring cannot be successfully accomplished by using only traditional forms for the planned management of the economy. The need arises to use new forms for the planned realization of scientific and technical achievements, namely comprehensive, goal-oriented programs for scientific and technical progress.

A third feature of the management of scientific and technical progress is the long-term nature of the realization of scientific and technical achievements in production. As a rule, the restructuring of production on a new technological basis takes a long time, frequently extending beyond the framework of the planning horizon. This means that within the mechanism for the management of scientific and technical progress the time factor should be given an important place.

A fourth feature is that realization of major scientific and technical innovations is accompanied by considerable risk, causes frangibility in existing economic and organizational links, and leads to production losses. These losses stipulate the need to form compensating reserves and funds for the economic stimulation of scientific and technical progress. The high degree of indeterminacy in the fulfillment of plan tasks associated with the realization of scientific and technical innovations also requires a more flexible form for determining such tasks, as for example, in the form of a divarication for a lower and upper value for plan indicators and so forth.

Disproportions in development rates and in the capacities of individual sectors participating in the realization of scientific and technical progress programs, differences in the conditions of economic calculations at associations and enterprises, and contradictions between current orientation in production and the long-term nature of the goals of scientific and technical progress require coordination of the interests of sectors and economic wings. This involves the fifth feature of management of scientific and technical progress. In order to coordinate these interests it is necessary to improve the system of plan indicators and strengthen the role and significance of the natural indicators that reflect more fully the effectiveness and quality of output, and also price setting for new equipment, funding and economic incentive during the period of assimilation of new equipment, and so forth.

#### Basic Directions in Improving the Management of Scientific and Technical Progress.

In the past years a number of major steps have been taken in the socialist countries to improve the management of scientific and technical progress. They include the following:

--strengthening the role and significance of long-term planning on the basis of the development of technical-economic concepts (experience in the Hungary), the Comprehensive Program for Scientific and Technical Progress (experience in the USSR), and long-term comprehensive programs for socioeconomic development (experience in Czechoslovakia, the GDR and Bulgaria);

--the transition from planning scientific and technical forward work to planning for mass production and the use of new technical facilities, materials, products and new technological processes;

--planning for increased output of high-quality products matching or exceeding the best achievements of domestic and world science and technology in terms of their technical-economic indicators; the products list for such output is regarded as a most important point in the production plan;

--the transition to planning and projecting technological systems or sets of machines that make it possible to coordinate the operation of equipment participating in a production process, and to insure along with high-quality output a decrease in labor expenditure and an increase in the coefficient of equipment utilization;

--the transition to a unified system of indicators and normativs for evaluating the effectiveness of planning and design decisions on the basis of the criterion of national economic effect;

--enhancing the role of economic contracts during the development, production and operation of new kinds of equipment;

--creating a compensating mechanism for the assimilation and introduction of major scientific and technical developments and carrying out work to raise the technical-economic level and quality of output;

--improving the system of economic incentive for producing new equipment and enhancing the economic responsibility of the manufacturer to the user of the new equipment;

--expanding foreign economic ties in the field of developing and introducing new equipment both through purchasing-and-marketing licenses and the export and import of machines, equipment, instruments and technological processes and through the organization of joint production, primarily within the CEMA framework;

--enhancing the role of extradepartmental expertise in evaluating major intersector programs and plans for scientific and technical development.

These directions in improving planned management for the realization of scientific and technical achievements in production are based on the development of an interlinked system of plans covering all stages in the development and utilization of new equipment. At the national economic level a determination is made of the major scientific and technical problems and the intersector goal-oriented programs for scientific and technical progress that insure the structural shifts in the national economy envisaged by the plan so as to satisfy production and social demands more fully and more comprehensively on the basis of the achievements of science and technology. It is precisely this base that also makes it possible to improve efficiency in the use of production resources, as reflected in the growth in labor productivity and return from investment and the decrease in material costs per unit of final output and in other indicators characterizing the efficiency of social production.

At the sector level, targets are set for the realization of intersector, goal-oriented programs for scientific and technical progress contained within the national economic plan, and also targets for solving sector scientific and technical problems and the organizational and technical development of the corresponding sectors. At the level of the association (or enterprise) a determination is made of tasks stemming from the national economic and sector plans, and also tasks involving the organizational and technical development of a specific association (or enterprise).

The interconnection of plans along the vertical stroke is insured by the continuity in corresponding tasks, and also by the system of comprehensive indicators and economic normativs, including the following: goal-oriented indicators for programs, problems and tasks; indicators for efficiency in the

utilization of economic resources (production output/capital ratio, material and energy inputs and so forth); indicators for social effectiveness (degree to which corresponding normativs are met in the cleanliness of the air and water, reducing minimum noise thresholds and so forth); indicators for economic effect; the prices of finished output or services; normativs for the formation of various reserve funds, economic incentive and so forth.

The interconnection along the horizontal stroke is achieved through continuity in the fulfillment of individual stages of work and the implementation of programs as a whole, from the conducting of scientific research and test and design work to the organization of mass output of a new product and its utilization in various sectors and spheres of the national economy.

The interconnection between plan targets to develop science and technology along the vertical and horizontal strokes is also insured through the time aspect. This is reflected in the continuity in the compilation of long-term, five-year and current (annual) plans.

The system of interlinked plans for the development of science and technology should be an integral part of a unified national economic plan. This task is solved through the appropriate balances of resources, products and so forth.

As already noted, the basis for the plan for the development of science and technology is formed by the comprehensive, goal-oriented programs for scientific and technical progress, which make up the so-called program section of the plan. We note some of the most important features in the compilation of programs as planning documents, as follows:

--Localizability. The limited nature of programs in terms of time and space is directly connected with the quite obvious fact that if the framework of a program is not delineated and it is not isolated from the overall flow of planned activity, it is pointless to formulate a task in program planning. Moreover, since the priorities in social requirements change, it is impossible to select permanent goals in the development of a socialist society as the goals of a particular program;

--Dimension. It is hardly rational to elevate to the rank of a program a set of measures whose implementation requires only a very insignificant proportion of the resources available to society within a planned period. As a rule, such measures are implemented in short time spans and are "incommensurable" in terms of significance with the planning horizon. Thus, the proportion of measures in a complex within the overall volume of planned activity should be sufficiently great;

Depth in development. It is clear that the most crucial elements of a plan that is also a program should be those most carefully prepared. This means that in the formulation of programs it is essential to use the entire arsenal of methods and means available to science; and among these, a leading role is played by economic-mathematical methods and computers. At the same time, the process of drawing up the programs should necessarily include a broad range of managers, including those at the highest level, since without their direct participation it is impossible to make effective and at the same time realistic decisions;

--Designation as part of the overall plan, directive nature. It has already been repeatedly emphasized that the programs make up an integral part of the unified national economic plan. At the same time the development of the programs is often regarded in isolation from the plan and there is discussion about the relationship between programs and the plan, sometimes contradictory discussion. Hence, among the most important characteristics of programs it is apparently essential to distinguish the self-evident condition of their inseparable designation as part of national economic plans;

--Manageability. The compilation of programs is accompanied by the expenditure of considerable resources and requires that a complex of organizational measures be implemented. In order to realize programs it is necessary to create a special organizational-economic and legal mechanism.

Experience in improving the management of scientific and technical progress and the tasks faced in this area are reflected in the decrees of the communist and workers' parties and governments of the socialist countries. Thus, for example, the CPSU Central Committee and USSR Council of Ministers decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" (1979) substantiates the need for the extensive use of program, goal-oriented methods in planning and the development of goal-oriented comprehensive programs.

The Comprehensive Program for Scientific and Technical Progress in the USSR over the Next 20 Years (broken down by five-year plans) is now the point of departure in the Soviet Union for the development of the plan for economic and social development. Each 5 years the necessary amendments are made to the comprehensive program and it is extended for the next five-year plan. This document is used as a basis for drawing up programs to solve the most important scientific and technical problems which form the program section of the national economic plan. Provision is made in the programs for the allocation of resources needed to implement them, and the head ministries and administrations responsible for the implementation of programs as a whole and of their individual tasks are determined.

One important problem in improving the management of scientific and technical progress is coordination of the system of plan indicators at the different levels (national economic, sector, economic wings), and also the system of indicators for the development of scientific and technical progress with indicators for other parts of the plan, namely industrial production, capital investments, labor productivity, funding and so forth.

#### Scientific and Technical Progress and the Problem of Quality.

One of the central tasks in the long-term development of a socialist economy is improving the quality of output. When considering the basic directions in which this is resolved it is essential to take into account the following features.

First, as a rule the problem of quality is resolved at the interface between the sectors. The quality of the final product is organically linked with

the quality of technological equipment, semifinished goods, materials and raw materials. Thus, any given problem has long since moved beyond the sector framework and become a major national economic problem.

Second, output quality is manifest in the consumption sphere. Here, the advantage of a new product can be clearly seen in comparison with an old product, and a real economic advantage is gained from its replacement. This is why the economic expedience of improving output quality cannot be determined without taking social requirements into account.

Third, it is important to evaluate not single units but the entire mass of output designed to satisfy planned demand. And in this regard quality is inseparable from quantity and from the relationships and proportions of the national economic plan. Hence it is clear that in order to control output quality it is necessary first and foremost to correctly evaluate its national economic significance. An enterprise must have at its disposal objective criteria for the effectiveness of its own work in order to be correctly oriented in the choice of the most economical methods to manage its affairs. Therefore, output quality is now regarded as one of the generalizing indicators for the efficiency of enterprise operations.

Fourth, expenditures in improving quality are made today, while the saving in consumption is obtained not immediately but after some time. A contradiction therefore arises between current and long-term plan tasks. In order to resolve these contradictions it is essential to have a long-term, nationwide program for improving output quality covering 5, 10 or more years. It should be an integral part of the long-term national economic plan.

These features in the control of output quality must be taken into account in the existing economic mechanism and within the system of plan indicators, and in price setting, funding and incentive and the structure of production management.

Major changes in the overall system for planned management of quality were made by the CPSU Central Committee and USSR Council of Ministers decree on improving the economic mechanism as mentioned above. In this document responsibility for output quality at the sector management level is clearly defined. It has been established that the ministry that is the head ministry in the production of a given product must answer for satisfying the requirements of the national economy and the public for output in the necessary product range and quality. Procedure has been established for the interaction of suppliers and consumers. Economic responsibility has been strengthened for timely and good-quality manufacture of products. It is a question primarily of insuring a planned level of reliability and quality for output during the course of the entire period laid down for its productive use.

The role of prices is substantially enhanced in providing economic incentive for output quality. Provision is made for the introduction of price increases for top category output and price decreases for obsolete output. Here it is important to note that the size of incentive additions to prices is calculated not from the actual volume of production but from the planned volume, and this creates additional interest in improving the quality of output.

Rich experience in improving the economic mechanism for controlling quality has also been gained in the other socialist countries. As in the Soviet Union, in many countries output quality has become one of the most important indicators for evaluating the economic activities of enterprises, associations and combines. Thus, in the GDR, provision is made in the production plan for targets for the production of top quality output that is awarded a mark of quality. As a rule, when the plans are compiled provision is made for higher growth rates for output awarded a mark of quality compared with growth rates for the total volume of commercial output. This kind of approach is practiced in Bulgaria, Hungary and Czechoslovakia.

In all the socialist countries the evaluation of output quality is done at the different levels of management through special certification commissions. High-quality output is awarded a state mark of quality. In order to receive this mark of quality an enterprise must usually submit an application to the state organs for standardization and product certification.

Thus, for example, in Bulgaria output quality is planned and considered using the state marks "K" and "I." These marks are awarded to products that equal the best world models and to products matching the average world level. To provide incentive for improving output quality price additions are made for goods and services that have been awarded the "K" mark. These price additions are temporary. For raw materials, materials, machines and sets of machines with an extended period of assimilation the temporary prices and additions can operate for up to 3 years, and for durables the period is for up to 2 years, while for goods and services of a seasonal nature the period is up to 6 months, and for all other goods, up to 1 year. Price reductions are made for obsolete goods and services. Using these, some or all profitability included in the prices for obsolete output or services is removed. In each specific case the Bulgarian State Planning Committee and Ministry of Finance resolve the question of the expediency of lowering prices for the consumer by the same amount as the price reduction for the producer, or of imposing any additional tax on profits while leaving the level of the ex-factory price the same.

The development of comprehensive systems for controlling output quality promotes improvement in the organization of production and economic incentive. In order for them to function successfully provision is made for periodic reviews of old standards, together with other quality characteristics in requirements that insure weight reductions in articles, reduce fuel and energy consumption, and standardize parts, assemblies and instruments.

The objective evaluation of the effect derived from high-quality articles and consideration of long-term tasks in planning their production and operation, and the restructuring of the system of interconnections between manufacturers and consumers guarantee high national economic efficiency in all work to improve the quality of industrial output.

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## SCIENCE NEEDS TALENTED DRIVEN YOUTH

Moscow IZVESTIYA in Russian 1 Jan 84 p 3

[Article by IZVESTIYA special correspondents Ye. Manucharova and S. Tsikora, under rubric "Point of View": "[Interview with] B. Ye. Paton"]

[Text] We had come to the end of the negotiations. The participants had expressed satisfaction with the results and had said goodbye. The guest was getting ready to go to the Kiev airport in order to leave for Duesseldorf. The guest was a plant director in the famous industrial Mannesmann firm. West German firms have had long-time contacts with IES, Electric Welding Institute [imeni Ye. O. Paton], UkSSR Academy of Sciences: this was not the first time that they were buying licenses for projects by the institute.

"He was a businesslike, interesting person," the IES director, famous scientist, Academician B. Ye. Paton said after he had left.

"That's right," we said, continuing our discussion. "But, forgive us, Boris Yevgen'yevich. What we're interested in now is not your partner, but, so to speak, another side: the people who create that for which people come from abroad. What makes it possible to resolve difficult problems? What qualities currently come to the foreground?"

[Answer] Well, what are you most interested in--the people or the problems?

[Question] Both, Boris Yevgen'yevich. Both. It might be best to start with the most difficult.

[Answer] All right, then. It's with the indoctrination of a modern way of thinking. Not too long ago there used to be a rather realistic ring to the little joke: work in science is the satisfying of one's own curiosity at the government's expense. Today's generation of our scientists differs substantially from the natural scientists who worked half a century ago. The very approach to the job has changed. A scientist keeps in the field of his attention not only the path, but also the final result of the research. And he puts the passion of his soul in this.

Of course, scientific-research institutes today could not be called "a comfort zone." Therefore the personnel question is quite complicated. And



without its resolution it is impossible to carry out the instruction by Yuriy Vladimirovich Andropov at the December 1983 Plenum of the CPSU Central Committee to the effect that it is necessary to engage constantly in the speeding up of scientific-technical progress.

We have an acute need for venturesome, driven, talented young people. That is, if we are speaking about the growing needs of science. As for the real opportunities, they are decreasing with every passing year. A complicated, deeply underlying process is occurring in the world. For the time being, it is not yet completely understood, but one can firmly state that it is typical of all the industrial states. The sphere of science is becoming much less attractive than it used to be two decades ago.

In our country, the number of young people enrolling in institutions of higher learning has also been decreasing. This pertains especially to the natural and technical departments. Young people nowadays are more interested in jurisprudence, the humanities in general, and art. Something else that seems to be attractive for them is the services sphere. Today even the queen of sciences--mathematics--is experiencing a shortage of personnel. Another area that is losing its fashionable appeal for young people is physics, which used to be considered the miracle of the twentieth century.

[Question] But, Boris Yevgen'yevich, no one has yet learned how to control the fashions...

[Answer] But, by the same token, no one can rely on unorganized forces either. There is such a thing as the planned training of specialists with a consideration of the vital importance of various trends. And there are also time-tested incentives: material self-interestedness, the opportunity for independent creativity. It is necessary to take more aggressive steps to activate them. The USSR State Committee for Science and Technology, USSR Gosplan, USSR Academy of Sciences, and USSR Ministry of Higher and Secondary Special Education, together with VAK [Higher Academic Courses], are completely capable of deciding how to use both the levers and the incentives.

For the time being, the shortage of personnel has not become obvious for everyone. It is not being felt especially acutely. But this favorable situation is only an apparent and short-term one. It was determined by the fact that the scientists who began their scientific path two or three decades ago are even more active. However, if urgent steps are not taken right now, serious difficulties will await us ahead. And, as always, the correcting of errors will require substantially more time and effort than actions taken ahead of time.

[Question] We would like to understand whether today's shortage of people in science is a shortage of people in general, or a shortage of those driven and talented ones who can work at the present-day level.

[Answer] As you yourselves said, "Both!" Only it is not necessary to dramatize the situation: although the attempts that have been made are still

disorganized, we have nevertheless found definite forms of attracting, selecting, and indoctrinating new people. People who will be able to resolve in science the complicated and vitally important tasks that were advanced by the Decree of the CPSU Central Committee and the USSR Council of Ministers concerning the measures for accelerating scientific-technical progress in the national economy.

[Question] Boris Yevgen'yevich, that document contains assignments for all the structural subdivisions of researchers--both for the branch institutes and the academy's institutes. But there is also something general for all of them, without which the acceleration of scientific-technical progress is impossible. What is it?

[Answer] First of all, it is the precise formulation of the goal. The decree mentions the need to "guarantee the rise in the level and rate of results" of scientific work. Consequently, we must develop the fundamental research, carry out on its basis applied research and development, and create new technological processes.

Here too it is necessary to be completely aware of what fundamental research is. Which research projects should be selected? How should they be organized in our time? Some scientists feel that the results of this kind of research work cannot be forecast at all--it is aimed at ascertaining the most general phenomena and natural laws that are absolutely unknown to us. Yes, actually the general ones. And, indisputably, science is, in its essence, a meeting with the unknown. But is it necessary for us to encompass immediately the entire stupendous range of the unknown?

With the high-speed rates of scientific-technical progress, we cannot allow ourselves to begin projects "outside of time and space"--with complete indefiniteness about when and how they will end. It is necessary to concentrate on that which is most important and to carry out research in a purposeful manner.

For example, take thermonuclear synthesis. Mankind needs it right now. The president of the USSR Academy of sciences, Academician A. P. Aleksandrov, says that the first demonstrational thermonuclear reactor is not too far off--it will appear at the dawn of the twenty-first century. Putting it another way, it will appear at the proper time. Because it is needed in order to rid mankind of the power hunger that is being felt more and more acutely because of the exhaustibility of the energy resources--coal, petroleum, gas. In this work, there has been a precise formulation of the long-range and short-range goal--the providing of energy to mankind by taking into our hands the control of the thermonucleus. In order to resolve these tasks, scientists in various specialties (physicists, mathematicians, energy specialists, etc., etc.) are carrying out in an extremely well-directed manner their thoroughgoing, serious research projects, and this does not lessen, but, rather, increases, their significance.

This kind of organization of the job--without the dissipation of efforts--is extremely effective. It can be called the sum total of the purposeful

fundamental research. We have introduced this concept in all the institutes of the UkSSR Academy of Sciences. The purposefulness of fundamental research is a command of the time. It makes it possible for us to execute the very important demand made by the part upon scientists-- "guarantee the rise in the level and rate of results of scientific-research projects."

[Question] What new practical needs required your institute to engage in purposeful fundamental research?

[Answer] Here is an example that is completely comprehensible by everyone. The welding of material began under ordinary terrestrial conditions. Now that welding is carried out everywhere--in outer space, and in the depths of the World Ocean. Creating a reliable technological process for the welding of metals by melting under water, at a depth of a hundred meters, or under conditions of the vacuum in outer space, would be absolutely impossible without the execution of fundamental research in such areas as the physics of the electric arc, the thermophysics of the melting of metal, and the physics of electronic beams.

The possibility of raising the rates of fundamental research and the rates of introduction has been largely determined by the structure of our institute complex. It has not only purely research departments, but also a design bureau, an experimental production entity, and experimental plants.

We are proud that among the academy's institutes we have been the pioneers in creating such a chain of subdivisions. At the present time that chain has been deemed to be necessary.

At the UkSSR Academy of Sciences, most of the institutes--not only the technical institutes, but also the physical, chemical, and biological institutes--have changed over to the organization of complexes.

It should be noted that the complex idea was by no means understood immediately, or by all the scientists, but subsequently it was indeed accepted. The turning point occurred only when it became obvious that the subdivision ladder leads not only downward, to production, but also that, without it, it is impossible to achieve the heights in fundamental science. The design bureaus and the experimental production entities make it possible for the researchers to create unique apparatus and units which no one else can provide for conducting a fundamentally new experiment.

[Question] Boris Yeygen'yevich, the decree governing the acceleration of scientific-technical progress mentions the necessity of and the desirability of creating temporary creative collectives...

[Answer] In certain institutes we have prototypes of such collectives. They have been created jointly with the branch institutes and individual enterprises. Very interesting results are being obtained, the research is speeding up, the departmental barriers are being overcome more successfully, and the ties with production are being reinforced and expanded. There is no

need, however, to think that everything here is simple and completely clear. Both legal and psychological obstacles will appear.

Here is a specific situation. The institute director is obliged to transfer the associates who are needed to "execute the idea" to the jurisdiction of an interdepartmental group. Sometimes including the material-technical base. And what status will this put the department director in, if his associates are taken away from him? First, he seems to be not really necessary for the resolution of a vitally important topic. Second, his subordinate is recognized as being more talented than he himself is. Third, the table of organization in the department is reduced, and, accordingly, the level of provision with equipment. Fourth, the person who has left to become part of a temporary group must, in accordance with the regulations, return to his previous location. But will he have the assurance that people will want to take him back at a place where his departure wounded someone else's self-esteem?

I am not exaggerating. This is a sad reality of life, its ability to squelch the growth of that which is new. Nevertheless this growth is inevitable. For the time being, the first steps are being taken on the path to the temporary scientific-production complexes that were mentioned in the decree and that are actually extremely necessary--they will help to break down the departmental barriers and to concentrate our efforts on the most important problems in the national economy. It is necessary--it is absolutely necessary--to find the correct, intelligent forms for the creation of these temporary collectives. Department of the particular trend in science and technology, they will have their specific features.

[Question] Boris Yevgen'yevich, people frequently hear production workers say, "Give us new technological processes and the problems of quality will be resolved." Is that so?

[Answer] It would be so, if one included in the concept of new technological processes the level of the final result. What do I understand by that? Scientific-technical progress must lead to a cardinal rise in the level of the output being produced. It is for the achievement of that the entire search for new methods is carried out. Consequently, the very concept "new technological process" must include the result--the correspondence of the output to the worldwide technical level; its innovativeness.

A technological process is not a goal in itself, but only a means of achieving a goal. That is how it should be viewed--if we want to obtain an actual benefit for the entire national economy.

And, returning to the beginning of our conversation about the indoctrination of a modern way of thinking, I can repeat over and over again: success in the job to be done will accompany only those scientists for whom the long-range nature of their way of thinking (a nature that is typical, in general, of researchers) is oriented toward the resolution of the key tasks that are confronting our country.

\* \* \*

We leave the Electric Welding Institute which was created exactly a half-century ago by the father of its present director--by Academician Yevgeniy Oskarovich Paton.

That was that long-distant era when the very term "scientific-technical progress" did not exist. And only a few scientists, such as Ye. O. Paton, were given the ability to see how their research was changing life and practice. But time has put everything in its proper place...

Today there is a holiday at the institute: its half-century celebration. The successes of the famous Electric Welding Institute imeni Ye. O. Paton have been largely determined by the gift given to true scientists--the ability to see the demands both of the present and of the future. And also, by their ability to draw initiatory young people into their difficult work, which is extremely necessary for the country.

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## CONFERENCE ON CONTROL PROBLEMS OPENS IN YEREVAN

Yerevan KOMMUNIST in Russian 15 Nov 83 p 2

[Article: "Control on the Level of New Tasks"]

[Text] In contemporary conditions of economic development, the tasks of increasing efficiency of scientific research, concentrating efforts on key problems, strengthening links between science and production, and accelerating introduction of scientific elaboration into practice acquire special significance.

"Make theories practically applicable, systems more efficient, and equipment maximally reliable" -- under this slogan the 9th All-Union Conference on Control Problems opened in Yerevan on 14 November. It was organized by the USSR Academy of Sciences, the USSR National Committee for Automatic Control, the Institute of Control Problems, the Armenian SSR Academy of Sciences Computation Center, the republic's Gosplan Computation Center, and the Yerevan Polytechnic Institute imeni K. Marx. Taking part in the work of the conference are more than a thousand specialists who represent academy institutions, scientific-research institutes, and design buro's.

Opening the conference with an introductory talk, V.A. Trapeznikov, USSR Academy of Sciences academician, noted that in the three years that have passed since the previous conference in Tallin, the theory of control and its application has been developing intensively and has made a significant contribution to the progress of the national economy.

The fundamental results of work and important unsolved problems will be the subject of our conference which should be both a review of our achievements and of assistance in determining directions of subsequent priority research.

Yu. Ye. Khodzhamiryan, deputy chairman of the Armenian SSR Council of Ministers, welcomed participants and guests of the all-Union conference on behalf of the government of the Armenian SSR.

It does great honor to the scientific technical-engineering public of Armenia, he said, that such a representative forum of the most important specialists in the field of control problems has gathered in Yerevan today. A large number of scientific institutions focusing on the theory and practices of automatic control development of equipment and systems of automation for different sectors of the national economy operate in Armenia.

Production of instruments and automation equipment, computer equipment, machine tools with digital programmed control, various types of electronic engineering equipment, and other control systems have been some fundamental focuses of Armenian industry for more than 20 years now. And these directions are being developed at very high rates. The successes of Armenian scientists and specialists have been highly evaluated and repeatedly awarded Lenin and State Prizes.

The All-Union Conference on Control Problems, emphasized Yu, Ye Khodzhamiryan, is yet another important step in developing the theory and practices of the science of automatic control in our country. An exchange of information between scientists and specialists on such a level, of course, is already in itself an outstanding event.

The president of the Armenian Academy of Sciences, academician V.A. Ambartsumyan, welcomed the participants in the conference on behalf of the presidium of the Armenian SSR Academy of Sciences.

USSR Academy of Sciences academician V.A. Trapeznikov, laureate of the Lenin and State Prizes of the USSR and Hero of Socialist Labor, presented the program report, "Scientific-Technical Progress and Our Tasks", at the plenary meeting. He noted the great urgency of problems being examined in light of decisions of the 26th party congress and subsequent Plenums of the CPSU Central Committee.

"Control processes permeated all levels of the activity of man and encompass all important national economic sites," he said. "Different fundamental and applied scientific challenges which have been considered at all-Union conferences arise in every level of control."

Despite the fact that the science of control and science in general in the wide sense have done a lot in past years, its influence on the development of the national economy and scientific-technical progress is still inadequate, which a number of party decisions and documents have commented on. Thus, for example, the payback on new capital on the level of the national economy takes an unjustifiably long time and dissipation of resources allocated for construction occurs.

The speaker formulated several scientific-technical problems in the field of building control systems. They are equally important for all levels of human activity and are based on a fundamental requirement -- economy of time at all levels of the system: design -- manufacture -- operation. In connection with this he dwelled on the need to reduce periods of development and introduction of new control systems and to reduce expenditures for building them.

An important stage of development in the field of control which affords a considerable savings in time is design automation. Simultaneous design of the control object and the control system is interesting and shows promise.

In his report on the condition and future of the development of automation and automation equipment in the republic the vice-president of the Armenian SSR

Academy of Sciences A.G. Iosif'yan said that a great deal of attention was devoted to problems of automation in all stages of the historical development of Armenia. Even in the 1930's automated micro-hydroelectric power plants for agriculture were built. Somewhat later -- in 1935 -- for the first time in the USSR, the Yerevan Hydroelectric Plant was built "na zamke" [literally -- "under lock and key" -- translator] -- without service personnel. It became the pioneer in the field of automation of hydroelectric, engineering and mechanical equipment. Later automation embraced the power plants of the North-Razdan series.

Development of automation became large scale after strong, multisectional electrical equipment, electronics, and radio engineering industry emerged in Armenia. A whole series of enterprises which became elements of the base of automation and automatic control systems went into operation. Scientific-research and experimental-design work on building computers and automatic control systems for many sectors of the national economy was developed on this base.

The speaker talked about the fundamental stages of development of computing equipment from adding machines to contemporary computers. Among the most promising developments the speaker mentioned an automated design system and the creation of equipment with programmed control for standard testing without human participation.

A.G. Iosif'yan familiarized the conference participants with work being done by scientists and specialists of the Byurakan Astro-Physical Observatory and the Yerevan Physics Institute in the field of automation of scientific-research and data processing, and talked about the creation of a collective-use system based on the Armenian SSR Academy of Sciences Computation Center and the future of the development of industrial manipulators and robot systems.

D. Ye. Okhotsimskiy, corresponding member of the USSR Academy of Sciences, presented a report, "Problems of Control During Robotization of Assembly Processes", at the plenary meeting.

V.D. Leporskiy, a department head at the Kiev Polytechnical Institute, spoke on the future of automatic control by large systems of the power industry based on computer networks.

K.L. Dallakyan, secretary of the Armenian Communist Party Central Committee, and A.P. Melkonyan and M. Kh. Kotanyan, department heads of the Armenian Communist Party Central Committee, were at the opening of the conference.

The conference continues working.

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## INTEGRATION OF ECONOMIC INFORMATION SERVICES ADVOCATED

Tallinn SOVETSKAYA ESTONIYA in Russian 5 Jan 84 p 2

[Article by V. Vokk, Deputy Chief, Estonian SSR Central Statistical Administration: "Economics and Information: Improve Management Techniques"]

[Text] The fulfillment of the tasks to intensify production and assure a balanced growth of its end-results is resulting in a marked growth in the importance of economic-statistical information. The growth of cost accounting and contractual relations and the practical introduction of normative, targeted-program and other modern management techniques, as mentioned in particular at the December (1983) CPSU Central Committee Plenum, increase the demand for such information. Hence, the republic's ministries and departments are refining the primary collection and analysis of statistical data and increasingly relying on computerized data processing as well as spurring socialist competition for a model organization of bookkeeping and accounting at enterprises, organizations and institutions.

At the same time, in some places economic and statistical data are inefficiently handled and often do not meet the present-day requirements of planning and management. We will identify below the most typical shortcomings.

First of all, standardized and interdepartmental primary accounting forms have not been completely introduced into accounting practice.

For example, at the Estonian SSR Ministry of Communications the indicators of the practical use of these forms are particularly low (60-70 percent for the first form, 45-75 percent for the second). The enterprises and organizations of this and certain other ministries sometimes use arbitrary accounting forms that have not been approved through the proper channels. The Estonian SSR Ministry of Procurement also lags behind in this respect.

Another typical shortcoming that also occurs in many ministries and departments is the desire to constantly expand statistical reporting. Quite often, instead of streamlining the analysis of existing statistical data, such ministries and departments strive to expand the volume of departmental reporting, sometimes even by resorting to illegal procedures without obtaining the approval of the Estonian SSR Central Statistical Administration.

Recently we had to rescind 13 different report forms of this kind at the Estonian SSR Ministry of the Food Industry which used them to gather from its

subordinate enterprises data that largely duplicated state statistical reports. The use of illegal (and subsequently rescinded) report forms has also been discovered at the Estonian SSR Ministry of Construction and Ministry of the Light Industry as well as at certain other ministries and departments.

The widespread use of illegal report forms whose compilation results in additional and needless expenditures of labor and funds, diverts experts from important work on compiling state statistical reports and adversely affects the quality and promptness of their presentation. The collection of such reports is a manifestation of bureaucratism which should be resolutely combatted.

The reliability of statistical data also is not assured in all cases. It happens sometimes that statistical reports contain major errors when presented to statistical agencies. A particularly low level of reliability is displayed by reports on manpower, material-technical supply and technological progress.

The largest number of errors is committed in the industrial output reports of enterprises of the Estonian SSR Ministry of Consumer Services and the capital construction reports of enterprises of the Estonian SSR Ministry of the Forest Industry. This year certain enterprises and organizations of the republic's construction, light industry, and culture ministries and the Estuprybkhov [Estonian Administration of Fishery Establishments] lagged in submitting their reports.

Report discipline and the reliability of statistical data are, in comparison, better at the enterprises where specially designated personnel attends to filling out statistical report forms.

The shortcomings enumerated above are due to various causes. But the principal causes are as follows: Certain administrators fail to grasp the importance of economic-statistical information. Secondly, the concerned departments of ministries and agencies and their subordinate enterprises, organizations and establishments are not prepared to process analytic and integrated economic-statistical information meeting present-day requirements. Moreover, the work to streamline accounting and report-keeping is not sufficiently purposive. At present many executives and experts have a consumerist attitude toward economic-statistical information. They see only the quantitative side of the problem. As a result, they tend to expand the volume of such information without paying attention to the labor-intensiveness of its processing.

One reason for this approach is that economic-statistical information is provided gratis by subordinate enterprises, organizations and establishments, as well as by the statistical agencies. In our opinion, it would be worth it to consider introducing a special fee for the provision of statistical data. Of a certainty that would compel many to start wondering whether they need or do not need some particular data and whether that might not cost too much.

The cost of compiling and publishing various statistical collections and bulletins as well as reports and analyses is quite specific and known. However, such expenses are debited to the state budget (except the statistical yearbook, which is sold in bookstores). In our opinion, information users should be charged for these expenses. This would be much more fair.

The information services of ministries and departments need to be restructured. At present there is no uniformity in this field. Every administration or division prepares reports confined to its own particular functions. As a result, general needs for analytic and especially integrated information remain unmet.

The conclusion is that every ministry and department should integrate the information-processing activities of all its subdivisions. It should also be considered that such integration is far from a simple matter. After all, every participant in information processing attempts to accomplish this work primarily insofar as it pertains to his particular functions and tasks. Hence a qualified and authoritative administrator should be appointed to head information activities. Clearly, at a ministry he should be one of the deputy ministers. At a number of industrial ministries and departments where the volume and complexity of the streams of economic-statistical and technical-economic information are particularly large, special posts of chief economists should conceivably be introduced. After all, such posts exist at large enterprises and production associations.

The establishment of integrated information services at ministries and departments would also promote the work to mechanize bookkeeping and accounting operations. To this end, the existing departmental computer centers should be subordinated to or even incorporated in these information services.

1386

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## TALLINN ELECTRICAL ENGINEERING RESEARCH INSTITUTE MARKS 25th ANNIVERSARY

Tallinn SOVETSKAYA ESTONIYA in Russian 25 Nov 83 p 2

[Article by E. Ivanov, secretary of the Party Organization of the Scientific Research Institute, Production Association "Tallinn Electrical Engineering Plant imeni M. I. Kalinin": "Twenty-Fifth Anniversary of the Scientific Research Institute of the Production Association 'Tallinn Electrical Engineering Plant imeni M. I. Kalinin'"]

[Text] It has already been a quarter of a century since the creation of the largest scientific establishment of the republic in Tallinn: the scientific research and technological design institute of planning and control systems in the electrical engineering industry of the production association "Tallinn Electrical Engineering Plant imeni M. I. Kalinin". It was formed due to the organizational talent of its first director, Arnold Kress, a well known party figure in the republic and an administrator, and the unusual scientific potential of his assistant Aleksandr Vol'dek, who later became an Academician of the Estonian SSR Academy of Sciences. The general line of the development of the institute is constant attention to acute needs of the national economy and unfailing maintenance of research and elaboration at a high scientific and technical level.

Having started as a regional electrical engineering scientific and methodological center, the institute was later engaged in the solving of urgent problems of industry, such as the development of automated systems of production (ASUP) at enterprises, or the development of promising power semiconductor devices, which now is one of the main directions of the institute. The national economic effect and specific benefit for specific enterprises was always regarded as of paramount importance. As for the strictly scientific level of the institute, it can be characterized by forty-two dissertations that were defended, including three doctoral, participation in many international, all-union and republican conferences and symposiums, and by more than 120 patents received by our members. A group of the workers of the institute was awarded the State Prize of the Estonian SSR for the development of a specialized computer.

As is known, a number of measures implemented in our country direct scientific teams to obtaining a final result which is eventually reflected in the economic effect obtained by the national economy. The dynamics of this effect can be judged only by two figures: in 1982, the research completed by the institute gave the country 3.2 million rubles, while the yield for just ten months of the current year was 3.3 million rubles. These millions of rubles mean savings in

kilowatt-hours of electric energy and tons of valuable metals, newly introduced production capacities and a decrease in the cost of products produced by the existing capacities. For example, the research on diffusion welding of rectifying cells of clamp-type power semiconductor devices conducted in the institute under the direction of Candidate of Technical Sciences Ye. Khutoryanskiy which have no analogs in the world practice of semiconductor instrument-making, resulted in a considerable increase in the percentage of the output of high-frequency devices and considerably lowered the labor input in their manufacturing. The institute was first in the instrument-making industry to start studies and designing of power semiconductor devices on the basis of a completely new material: gallium arsenide. The introduction of these diodes, thyristors and transistors into the national economy will make it possible to reduce considerably the dimensions of conversion devices, and this means not only a saving in metal, but also a reduction in weight, which is of substantial importance in their transportation. Moreover, these devices are also considerably better than the silicon ones which are being produced now with respect to a number of other important characteristics. The work on the development of these devices under the directorship of Doctor of Technical Sciences G. Ashkinazi in L. Zolotarevskiy's laboratory by Candidates of Sciences V. Timofeyev and L. Mazo is nearing completion and they will soon go into production.

The institute has been working for more than twenty years on the use of computers in the national economy. They range from the specialized electronic computer STEM for the automation of technological preparation of production to machine designing of power semiconductor devices. The second phase of the development of a system for automatic designing of power semiconductor devices is in progress within the framework of the All-Union scientific and technical program (directed by Candidate of Physical and Mathematical Sciences V. Grigorenko). This system is intended as an aid to design engineers which will predict the best solutions.

The development of ASU TP [automated system for the control of technological processes] and the solution of accompanying problems is of great significance to the national economy. This work is being done by the automation department, one of the oldest departments of the institute. Our institute has become a base for the development of one of the three experimental interconnected computing centers of the electrical engineering industry. At the present time, the center directed by A. Kuz'min processes information of four enterprises of this industry in Tallinn. Principles which eventually will be used in the industry's computing centers are being perfected and tested in practical work.

Finally, the third basic direction of the institute is the development of technological equipment and instruments. First of all, we should mention the work on the development of hard-alloy dies which were awarded eleven medals of the USSR VDNKh [Exhibition of the Achievements of the National Economy]. A very promising work in this direction is conducted under the direction of R. Eygi, Ye. Danilin and E. Kuks.

The name of the institute indicates that it belongs to the production association "TEZ imeni M.I. Kalinin". Our institute has been cooperating with industry exactly ten years, and now the work for the production association (which amounts to more than one third of the total volume of the institute's jobs) has a definite priority in our activities. We feel that our task is not to solve immediate

one-day problems, but to define and solve problems which are five to ten years ahead of the today's production process. Only such research can yield a substantial economic effect and be truly helpful to industry. It is gratifying that the management of the production association understands our goals practically in the same way and is our ally in the formulation of promising tasks.

Of course, there are still many shortcomings in our work and it would be ridiculous to deny this. However, continuous and purposeful work and activity of the party organization of the institute and our unremitting ties with the plant make it possible to hope that our personnel will continue to work productively for the national economy in the name of our common goals.

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CSO: 1814/81

## BRIEFS

**BELORUSSIAN RESEARCH INSTITUTE CRITICIZED--Minsk--**The Belorussian SSR Committee of People's Control received a letter advising that the Belorussian SSR Affiliate of the All-Union Scientific Research and Design Institute of "Galurgiya" [?] under the Ministry of the Fertilizer Industry has been condoning major shortcomings in fulfilling directives from superior organs with respect to making scientific research more effective and putting it to practical use more rapidly. In addition, breaches of financial discipline occur at that Affiliate. An inspection confirmed these facts. It turned out that the Affiliate pays little attention to solving the basic development problems of the republic's potash industry such as: increasing the recovery of potassium chloride, automating the extraction and processing of ores and reducing environmental pollution. Some of its projects contribute nothing new to the branch's technology and equipment. Extraneous research is conducted and equipment already developed and produced in other branches is being devised. In the last 3 years only every 10th topic of research has paid for itself. At the same time, the Affiliate's heads have been generously, and often unjustifiably, distributing bonuses and extra salary allowances. The Committee has reprimanded comrade Vorob'yev, the director of the Affiliate, for major shortcomings in performance and breaches of financial discipline. It also imposed on him the sanction of paying partial compensation for the damage caused. The Committee further placed comrade Vorob'yev under the obligation of providing to the collective an explanation of the causes of the violations committed and informing it of measures that are to be taken in order to rectify the situation. [Text] [Moscow IZVESTIYA in Russian 14 Dec 83 p 2] 1386

**CRYOGENIC LABORATORY OPERATES IN MOLDAVIA--**The Cryogenic Center of the Moldavian SSR Academy of Sciences has begun to produce results. Its personnel works both on production problems and on complex experimental research into new physical effects in the presence of strong magnetic fields and high excitation conditions at ultra-low temperatures. On the basis of findings obtained at the Laboratory of Low-Temperature Physics, Institute of Applied Physics, a high-sensitivity superconducting sensor has been developed under the direction of candidate of physico-mathematical sciences A. Sidorenko. This sensor makes possible highly effective prospecting for mineral deposits as well as the detection of schools of fish in the sea and animal populations in the taiga, the tundra and other relatively inaccessible areas. Photo: L. Karagenov, head engineer at the Cryogenic Center, and A. Sidorenko, laboratory director, conducting yet another low-temperature experiment. [Photo by V. Kolos] [Text] [Kishinev SOVETSKAYA MOLDAVIYA in Russian 27 Jan 84 p 4] 1386

**NEW OCEAN RESEARCH INSTITUTE--Vladivostok (TASS)--**On the eve of the New Year Holiday a new scientific establishment, the Institute of Economics of the



Ocean, has been added to the Far Eastern Research Center of the USSR Academy of Sciences. The principal purpose of this new institute is to develop the scientific principles for the economic utilization of vast areas of the Pacific Ocean as well as to solve the attendant fishery, social and demographic problems. An important place in the activities of the new institute will be occupied by problems of international law with respect to the exploitation of the resources of the Pacific Ocean. [Text] [Moscow VODNIY TRANSPORT in Russian 5 Jan 84 p 4] 1386

NEW SCIENCE, TECHNOLOGY PERIODICAL--The first three issues of NTR: PROBLEMY I RESHENIYA [The Scientific and Technological Revolution: Problems and Solutions], a journal of the Znaniye [Knowledge] All-Union Society, have been published. This new journal, published by the Society's Board and the Znaniye Publishing House, has now reached us. The three issues vary in their contents and their format is that of a streamlined modern periodical. The work of the editorial collective is directed by the editorial council (chairman I. S. Nayashchikov, chairman of the USSR Goskomizobreteniy [State Committee for Inventions]). The members of the council include Soviet scientists engaging in basic research in many fields; representatives of the management of the USSR Gosplan and the GKNT [State Committee for Science and Technology]; and heads of certain regional centers of the USSR Academy of Sciences. These first few issues contain articles by the Academicians G. I. Marchuk, Ye. P. Velikhov, A. I. Tselikov; the deputy chairmen A. M. Lalayanets (USSR Gosplan) and G. F. Ivanovskiy (USSR Gosnab); L. B. Yermyn, First Deputy Chairman of the RSFSR Council of Ministers, and others. Each issue begins with a detailed examination of an applied scientific-research problem (the first issue, with: "Energy Resources: Ways and Means of Conservation") or several targeted comprehensive scientific-technical programs. The impression arises that NTR: PROBLEMY I RESHENIYA, by providing the reader with "first-hand" variegated scientific and technical information in the most varied genres, is becoming a reliable reference aid in practical mastering of the latest achievements of science and technology to a broad range of researchers, engineers and organizers of science and production. [By V. Shorin, doctor of technical sciences, professor, rector of the Higher School for Occupational Advancement imeni Shvernika] [Text] [Moscow SOVETSKAYA ROSSIYA in Russian 13 Nov 83 P 2] 1386

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